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A TREATISE

ON THE

DISEASES OF WOMEN

FOR STUDENTS AND PRACTITIONERS

BY

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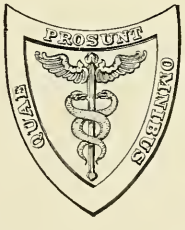

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DEDICATED

TO

MY FORMER CHIEF

J. CLARENCE WEBSTER

WITH ALL RESPECT

PREFACE

This book is the natural outgrowth of the author's *Diagnosis of Diseases of Women.* Much that was contained in the former work has been revised, the subjects have been reclassified, and more than an equal amount of text and illustrations has been added for the purpose of making a complete text-book on the subject of diseases of women.

It has been the endeavor of the author to present the subject in detail without encumbering the text with needless repetitions. With this object in view, separate chapters are devoted to the subjects of Non-operative Methods of Treatment, Hygiene and Dress, Preparation of Patient for Operation, Preparation of Operating Room, Field of Operation and Surgical Utensils, Choice of Anesthetics, Diet, Post-operative Complications and Care of Patients after Operation, and frequent references are made to these subjects throughout the text.

An effort has been made to give full scope to the discussion of conservative methods of treatment, such as douches, baths, exercise, massage, diet, dress, and tampons. The author is of the opinion that the non-operative methods of treatment of diseases of women have not received their due share of consideration in text-books and in practice which they rightly deserve.

The subject of diagnosis has been placed on an anatomical basis, both macroscopic and microscopic, for it is preëminently true of diseases of women that the making of a diagnosis is in large part the recognition of the morbid anatomy.

There are certain subjects presented in the text which may be considered as on the borderline between gynecology and obstetrics; such are surgical treatment of puerperal infection, fibroids of the uterus complicating pregnancy, prolapse of the pregnant uterus, ovarian cysts complicating pregnancy, and the immediate repair of the cervix and pelvic floor. Such subjects emphasize the illogical separation of gynecology and obstetrics. Because of their relative importance special chapters have been devoted to gonorrhea and tuberculosis in women, and a proportionately large amount of space has been allotted

to the discussion of fibroids of the uterus, cancer of the uterus, ovarian cysts, extra-uterine pregnancy, pelvic inflammations, lacerations of the pelvic floor, and retroversioflexion and prolapse of the uterus.

The author desires to express his indebtedness to Dr. N. Sproat Heaney for his valuable assistance in proof-reading; for the service of Mr. Charles F. Bauer in preparing the illustrations, and for the generous and courteous coöperation of the Publishers.

P. F.

Omaha, 1913.

CONTENTS

CHAPTER I

Introductory: Hemorrhages from the Genital Tract

The Clinical History 17
Form of Case Record 17
Address 19
Age 19
Occupation 20
Nationality 21
Social State 21
Number of Children and Miscarriages 21
General Predisposing Conditions 21
Family History 21
Previous Illnesses 22
Present Complaints 22
Menstrual History 22
Hemorrhage from the Genital Tract 22
Hemorrhage from the Vulva 22
Hemorrhage from the Vagina 23
Hemorrhage from the Cervix 23
Menstruation 23
Anatomy of Menstruating Uterus 24
Tubal Menstruation 26
Menstruation without Ovaries 26
Uterine Hemorrhage 27
Systemic Causes 27
Local Causes 28
Character of Discharged Blood 33
Treatment of Uterine Hemorrhage 33

CHAPTER II

Disorders Associated with Menstruation

Amenorrhea 27
General Causes 37
Local Causes 39
Menstrual Molimina 40
Vicarious Menstruation 40
Diagnosis of Amenorrhea 40
Treatment of Amenorrhea 41
Dysmenorrhea 42
Primary, Causes of 42
Secondary, Causes of 43
Membranous Dysmenorrhea 45
Intermenstrual Pain 47
Treatment of Dysmenorrhea 48
Backache 56
Causes 56
Static Backache and Treatment 57
Gonorrheal Arthritis 58
Treatment 58
Coccygodynia 58
Diastasis Recti: Enteroptosis 59
Causes 60
Symptoms 60
Treatment 61

CHAPTER III

Leucorrhea—Sterility—The Menopause

Leucorrhea:
Normal Secretions of the Genital Organs . . . 63
Clinical Grouping According to Age—
Infants . . . 63
Virgins . . . 64
Sexual Maturity . . . 64
Old Age . . . 64
Odor as an Aid to Diagnosis . . . 65
Treatment . . . 65
Sterility:
Definitions . . . 67
One-child Sterility . . . 67
Conditions Essential to Conception . . . 67
Etiology . . . 68
General Causes . . . 68
Local Causes . . . 69
Treatment . . . 72
The Menopause:
Premature Menopause . . . 73
Delayed Menopause . . . 74
Time of Appearance . . . 74
Clinical Manifestations . . . 75
Influence of Morbid Conditions in the Pelvis . . . 76
Management of the Menopause . . . 76

CHAPTER IV

Examinations of the Blood—Bacteriological Examinations

Examinations of the Blood . . . 78
Morphology of Blood Cells . . . 78
Red Cells . . . 78
White Cells . . . 79
Leucocytosis of Pregnancy . . . 80
Postpartum Leucocytosis . . . 80
Posthemorrhagic Leucocytosis . . . 80
Inflammatory Leucocytosis . . . 81
Leucocytosis of Malignancy . . . 82
Leucocytosis of Ovarian Tumors . . . 82
Differential Count of Leucocytes . . . 82
Secondary Anemia . . . 83
Bacteriological Examinations:
Bacteriology of Normal Genital Tract . . . 84
Bacteriology of Vulva and Vagina . . . 85
Bacteriology of Uterus . . . 86
Bacteriology of Fallopian Tubes . . . 87
Bacteriology of Ovary . . . 88
Bacteriology of Peritoneum and Pelvic Cellular Tissue . . . 89

CHAPTER V

General Physical Examination

Preliminary Measures . . . 90
External Abdominal Examination . . . 91
Inspection . . . 91
Palpation . . . 93
Percussion . . . 97
Auscultation . . . 99
Mensuration . . . 99

CHAPTER VI

Examination of External and Internal Genitalia

Inspection of External Genitalia 100
Digital Examination of Internal Genitalia 100
Digital Examination of Vagina 100
Combined Vaginal Examination 106
Abdominovaginal Examination 107
Palpation of Ureters through the Vagina 112
Digital Examination of the Rectum 112
Pelvimetry 117

CHAPTER VII

Instrumental Examination

Vaginal Speculum 118
Vulsellum Forceps 120
Uterine Dilators 121
Uterine Sound 122
Preliminary Procedures 123
Indications 123
Contra-indications 125
Dangers 125
Uterine Curet 126
Indications 126
Contra-indications 127
Dangers 128
Technic 129
In Treatment 130
Exploratory Punctures and Incisions 132

CHAPTER VIII

Microscopic Examination of Scrapings and Excised Parts—The Diagnosis of Expelled Membranes from the Uterus

Removal of Uterine Tissue for Diagnostic Purposes 133
Test Excision from the Cervix 134
Test Curettage of the Uterus 134
Frozen Sections of Excised Pieces and Scrapings 134
Fixing the Specimens 136
Hardening and Embedding 136
Staining and Mounting 138
Inspection of Uterus after Removal 139
The Diagnosis of Expelled Membranes from the Uterus 140
Membranous Dysmenorrhea 140

CHAPTER IX

Ectopic or Extra-uterine Pregnancy

Etiology 143
Recurrent and Multiple Ectopic Pregnancy 144
Combined Uterine and Tubal 145
Bilateral Tubal 145

Classification 146
Ampullar 147
Interstitial 150
Infundibular 150
Ovarian 151
Causes of Ending of Gestation 152
Retrogressive Changes in Dead Fetus 154
Anatomical Changes in Tube 154
Clinical Diagnosis 155
Subjective Signs 156
Objective Signs 156
Differential Diagnosis 158
Treatment 164
Unruptured Tubal Pregnancy 164
At Time of Rupture 165
Late after Rupture 167
Intraligamentary Extra-uterine Pregnancy 170
Interstitial Pregnancy 170
Advanced Extra-uterine Pregnancy 170
Combined Extra-uterine and Intra-uterine 171
Ovarian Pregnancy 171
Pregnancy in Rudimentary Horn of Uterus 171
Mortality of Extra-uterine Pregnancy 172

CHAPTER X

Chorioepithelioma Malignum

Etiology 174
Clinical Diagnosis 175
Macroscopic Appearance 176
Microscopic Appearance 176
Malignant Degeneration of Hydatiform Mole 177
Primary Chorioepithelioma Outside of the Placental Site . . . 182
Histogenesis 184
Diagnosis 185
Treatment 186

CHAPTER XI

Non-operative Methods of Treatment

Hydrotherapy 188
Baths 189
Vaginal Douche 196
Intra-uterine Douche 200
Saline Injections 202
Enteroclysis 203
Hypodermoclysis 204
Intravenous Injections 205
Ice Bag 207
Hot Compresses 207
Hot-water Bag 207
Water Drinking 208
Hot Air Treatment 209
Hot Pack 210
Counterirritation 211
Tampons 211
Pelvic Massage 215
Pressure Therapy 220
Electricity 223

X-ray Therapy 223
Swabs 225
Serum and Organotherapy 227

CHAPTER XII

Hygiene and Dress

Hygiene of the School-girl 229
Physical Training in Schools 230
Public Playgrounds and Baths 230
Indoor Exercise 230
Dress 237
Corsets 239

CHAPTER XIII

Preparation of Patient for Operation

Examination for Contra-indications 242
Local Treatments Preparatory to Operation 243
Preparation of the Field of Operation 244
Choice of Local or General Anesthesia 246
Local Anesthesia 247
General Anesthesia 248
Spinal Anesthesia 250
Combined Gynecological Operations 250
Diet 251

CHAPTER XIV

Principles of Asepsis in Gynecology

Sterilization of Field of Operation 252
Disinfection of Hands and Forearms 252
Preparation of Surgical Utensils 254
Preparation of Gauze and Sutures 255
Preparation of Instruments 256
Sterilized Water 257
Preparation of Operating Room 257
Preparation for Operation in Private House 258
Operating Bag 260

CHAPTER XV

Anomalies and Malformations of the Genital Organs

Anomalies and Malformations of the Vulva 262
Absence of Vulva 262
Double Vulva 262
Atresia of Vulva 262
Infantile Vulva 263
Hypertrophy of Vulva 264
Congenital Anomalies of Clitoris 264
Adhesions of the Prepuce 265
Congenital Fissures of the Vulva 265
Anatomy and Malformations of the Hymen 267
Cysts of the Hymen 269

Anomalies and Malformations of the Vagina 270
Absence 270
Atresia and Stenosis 272
Double Vagina 275
Blind Pouches 276
Anomalies and Malformations of the Uterus 276
Uterus Deficiens 276
Uterus Rudimentarius 279
Uterus Fœtalis 279
Uterus Unicornis 280
Uterus Septus 282
Uterus Bicornis 282
Uterus Didelphys 286
Uterus Accessorius 286
Anomalies and Malformations of the Fallopian Tubes 286
Anomalies and Malformations of the Ovaries 286
Absence of One or Both Ovaries 286
Congenital Smallness of One or Both Ovaries 287
Supernumerary Ovaries 287
Congenital Largeness of One or Both Ovaries 287

CHAPTER XVI

Malpositions of the Genital Organs

Malpositions of the Vaginal Walls 288
Cystocele 288
Rectocele 299
Vaginal Hernia 302
Malposition of the Uterus 305
Normal Position 305
Pathological Mobility 308
Pathological Fixation 308
Anteposition 309
Retroposition 310
Lateroposition 312
Elevatio Uteri 313
Torsion 315
Prolapsus Uteri 315
Prolapse of the Pregnant Uterus 333
Inversion 334
Anteversion 345
Anteflexion 347
Retroversioflexion 352
Hernia 381
Malpositions of the Fallopian Tubes 382
Normal Position 382
Changes in Position 384
Malpositions of the Ovaries 384
Normal Position and Histology 384
Changes in Position 386
Descensus Ovarii 386
Hernia of Tube and Ovary 388

CHAPTER XVII

Circulatory Disturbances and Inflammations of the Genital Organs

Bacteriology of the Normal Genital Tract 389
Etiology 390
General Causes 390
Local Causes 391

CHAPTER XVIII

Circulatory Disturbances and Inflammations of the Vulva and Vagina

Circulatory Disturbances of the Vulva . . . 393
Varicose Veins (Angioma Vulvæ) . . . 393
Hematoma of the Vulva . . . 395
Edema of the Vulva . . . 396
Gangrene of the Vulva . . . 396
Noma Pudendi . . . 397
Inflammation of the Vulva . . . 397
Vulvitis . . . 397
Simple Catarrhal . . . 397
Gonorrheal . . . 398
Erysipelatous . . . 398
Puerperal . . . 399
Tuberculous . . . 399
Syphilitic . . . 399
Diphtheritic . . . 399
Actinomycosis . . . 400
Treatment . . . 404
Bartholinitis . . . 401
Vulvitis Furunculosis . . . 401
Pruritus Vulvæ . . . 403
Inflammation of the Vagina . . . 406
Vaginitis (Colpitis) . . . 406
Catarrhal . . . 407
Ulcerative . . . 407
Tuberculous . . . 408
Emphysema Vaginæ . . . 408
Condylomatous . . . 419
Senile . . . 409
Paravaginitis . . . 411
Vaginismus . . . 412

CHAPTER XIX

Inflammations of the Uterus

Endocervicitis (Endometritis Cervicalis) . . . 415
Erosions of the Cervix . . . 416
Simple . . . 417
Papillary . . . 417
Follicular . . . 417
Ulcers of the Cervix . . . 420
Decubitus . . . 420
Tuberculous . . . 420
Cancerous . . . 420
Tuberculosis of the Cervix . . . 420
Endometritis . . . 420
Clinical Classification . . . 421
Acute . . . 421
Chronic . . . 422
Hemorrhagic . . . 422
Catarrhal . . . 422
Dysmenorrheic . . . 422
Tuberculous . . . 423
Gonorrheal . . . 423
Decidual . . . 424
Puerperal . . . 424
Postabortive . . . 424
Exfoliative . . . 424
Senile . . . 425

Endometritis:
Anatomical Classification . . . 425
Macroscopic . . . 426
Hypertrophic . . . 426
Fungous . . . 426
Villous . . . 426
Polypoid . . . 426
Ulcerative . . . 426
Pseudodiphtheritic . . . 426
Microscopic . . . 427
Glandular . . . 427
Interstitial . . . 431
Chronic Metritis . . . 438
Abscess of the Uterus . . . 438
Treatment of Inflammation of the Uterus . . . 434
Acute Metritis . . . 434
Chronic Metritis . . . 438
Endocervicitis . . . 442
Erosions of the Cervix . . . 444

CHAPTER XX

Circulatory Disturbances, Inflammations, and Infectious Granulomata of Fallopian Tubes and Ovaries

Circulatory Disturbances in the Fallopian Tube . . . 445
Causes . . . 445
Anatomical Diagnosis . . . 446
Clinical Diagnosis . . . 446
Inflammations and Infectious Granulomata of the Fallopian Tube . 446
General Considerations . . . 446
Classification of Salpingitis . . . 447
Catarrhal . . . 447
Purulent . . . 452
Tuberculous . . . 462
Syphilis of the Fallopian Tube . . . 466
Actinomycosis of the Fallopian Tube . . . 466
Parasites of the Fallopian Tube . . . 462
Treatment of Inflammatory Diseases of the Tubes . . . 467
Non-operative Treatment . . . 467
Conservative Operations . . . 468
Radical Surgical Treatment . . . 470
Operative Treatment . . . 471
Circulatory Disturbances in the Ovary . . . 480
Etiology . . . 480
Anatomical Diagnosis . . . 480
Clinical Diagnosis . . . 482
Inflammations of the Ovary (Oöphoritis, Ovaritis) . . . 483
Acute Ovaritis . . . 483
Chronic Ovaritis . . . 483
Cystic Degeneration of the Ovaries . . . 484
Abscess of the Ovary . . . 489

CHAPTER XXI

Peritonitis

General Peritonitis . . . 493
Non-septic, Traumatic . . . 493
Septic . . . 494
Postoperative . . . 495
Puerperal . . . 500
Gonorrheal . . . 501
Tuberculous . . . 502
Pelvic Peritonitis . . . 503

CHAPTER XXII

Parametritis (Pelvic Cellulitis)

Acute Parametritis 510
Chronic Parametritis 512
Varicocele of the Broad Ligament 517

CHAPTER XXIII

Gonorrhea in Women

Historical Sketch 519
Gonococcus of Neisser 519
Etiology 519
Diagnosis 522
Prognosis 527
Prophylaxis 529
Treatment 529
Gonorrhea in Children 536

CHAPTER XXIV

Tuberculosis of the Genital Organs

Etiology 539
1. Primary Infection 540
2. Secondary Infection 540
Tuberculosis of the Vulva and Vagina 540
Tuberculosis of the Cervix 541
Tuberculosis of the Uterus 541
Tuberculosis of the Ovaries 541
Tuberculosis of the Fallopian Tubes 541
Tuberculous Peritonitis 544
Prognosis 544
Treatment 545

CHAPTER XXV

Nutritional Disturbances of the Genital Organs

Retrogressive Tissue Changes 546
Atrophy of the Vulva (Kraurosis Vulvæ) 546
Atrophy of the Vagina 549
Atrophy of the Uterus 549
Physiological Atrophy 549
Superinvolution of the Uterus 549
Atrophy of the Ovary 550
Progressive Tissue Changes 551
Elephantiasis Vulvæ 551
Condyloma Acuminata 552
Hypertrophy of the Vulva 553
Hypertrophy of the Clitoris 553
Hypertrophy of the Labia 553
Hypertrophy of the Cervix 553
Supravaginal Hypertrophy 554
Infravaginal Hypertrophy 554
Subinvolution of the Uterus 555
Hypertrophy of the Ovary 558

CHAPTER XXVI

New Formations of the Vulva and Vagina

New Formations of the Vulva 559
Benign Tumors of the Vulva 559
Fibroma 559
Lipoma 559
Enchondroma 559
Neuroma 559
Sebaceous Cysts 559
Dermoid Cysts 560
Vulvar Cysts 560
Cysts of the Hymen 560
Cancer of the Vulva 562
Sarcoma of the Vulva 567
New Formations of the Vagina 567
Cysts of the Vagina 567
Fibromyoma of the Vagina 569
Carcinoma of the Vagina 570
Sarcoma of the Vagina 574
Syncytioma Vaginæ 574
Endothelioma of the Vagina 574

CHAPTER XXVII

Fibromyoma of the Uterus

Etiology 575
Histogenesis 576
Anatomical Diagnosis 577
Recurrence 584
Microscopic Diagnosis 584
Adenofibromyoma Uteri 585
Degenerations of Fibroids 586
Clinical Characteristics 591
Clinical Diagnosis 592
Differential Diagnosis 597
Effect on Neighboring Organs 604
Treatment 605
Operations for Uterine Fibroids 608
Vaginal Myomectomy 609
Vaginal Hysterotomy 612
Vaginal Celiotomy 614
Abdominal Myomectomy 617
Hysteromyomectomy 620
Vaginal 620
Abdominal 621
Fibroids Complicating Pregnancy, Labor, and Puerperium 630

CHAPTER XXVIII

Carcinoma and Sarcoma of the Uterus

Carcinoma of the Uterus 632
Topographical Classification 632
Etiology 632
Anatomical Diagnosis 634
Clinical Diagnosis 639
Differential Diagnosis 644
Diagnosis of Extension 651

Carcinoma of the Uterus:
Treatment . . . 658
Operative Treatment . . . 660
Simple Vaginal Hysterectomy . . . 660
Byrne Method . . . 660
Schuchardt Operation . . . 662
Radical Abdominal Operation . . . 665
Treatment of Cancer of Cervix Complicating Pregnancy . . . 676
Treatment of Inoperable Cancer of Cervix . . . 677
Treatment of Cancer of Body of Uterus . . . 679
Endothelioma . . . 692
Sarcoma of the Uterus . . . 693
Etiology . . . 693
Anatomical Diagnosis . . . 694
Microscopic Diagnosis . . . 696
Clinical Diagnosis . . . 697
Prognosis . . . 697
Treatment . . . 698

CHAPTER XXIX

Tumors of the Pelvic Ligaments, Fallopian Tubes, and Vagina

Tumors of the Pelvic Ligaments . . . 699
Tumors of the Broad Ligaments . . . 699
Tumors of the Ovarian Ligaments . . . 699
Tumors of the Round Ligaments . . . 700
Treatment . . . 700
Tumors of the Fallopian Tubes . . . 700
Papilloma . . . 700
Polyps . . . 701
Myoma and Fibroma . . . 701
Dermoid Cysts . . . 701
Lipoma . . . 701
Fibromyxoma Cystoma of the Fimbriæ . . . 701
Sarcoma . . . 701
Carcinoma . . . 701
Cystic New Formations of the Fallopian Tubes . . . 703
Hydatids of Morgagni . . . 703
New Formations of the Ovary . . . 703
Simple Cysts . . . 703
Follicular Cysts . . . 703
Corpus Luteum Cysts . . . 703
Tuboövarian Cysts . . . 703
Tumors of the Ovaries . . . 706
Carcinoma . . . 712
Dermoid Cysts . . . 714
Connective-tissue New Formations . . . 715
Fibroma . . . 715
Myoma . . . 715
Myxoma . . . 715
Enchondroma and Osteoma . . . 715
Angioma and Lymphangioma . . . 715
Sarcoma . . . 715
Endothelioma . . . 717
Parovarian Cysts . . . 718
Ovariotomy . . . 736
Vaginal . . . 737
Abdominal . . . 739
Malignancy of Ovarian Tumors . . . 742
Treatment of Ovarian Tumors Complicating Pregnancy, Labor, and the Puerperium . . . 744
Postoperative Complications . . . 744
Mortality . . . 752
Conservative Operations . . . 753

CHAPTER XXX

Traumatic Injuries of the Genital Organs

Wounds of the Vulva and Pelvic Floor 762
Colpoperineorrhaphy 763
External Superficial Tear 763
Internal Tear and Combined External and Internal Tears (Incomplete Laceration of the Perineum) 765
Late Repair of a Complete Rupture of the Rectovaginal Septum . . . 782
Repair of the Sphincter Ani Muscles 786
Relaxed Outlet of the Rectovaginal Septum 786
After-treatment of Plastic Operations on the Pelvic Floor . . . 788
Wounds of the Vagina 788
Acquired Stenosis and Atresia of the Vagina 790
Wounds of the Cervix 791
Immediate Repair of a Lacerated Cervix 793
Amputation of the Cervix 795
Perforating Wounds of the Uterus 797

CHAPTER XXXI

Fecal and Genito-urinary Fistulæ

Fecal Fistula 801
Rectovaginal Fistula 801
Retroperineal Fistula 804
Rectolabial Fistula 805
Enterovaginal Fistula 806
Genito-urinary Fistulæ 806
Urethral Fistula 806
Vesical Fistula 807
Vesicovaginal Fistula 807
Vesico-uterine Fistula 810
Vesicocervical Fistula 810
Enterovesical Fistula 811
Ureteral Fistulæ 821
Ureteral Fistula at Vault of Vagina 821
Ureterocystostomy 822
Nephro-ureterectomy 823

CHAPTER XXXII

Diseases of the Urinary System

Diseases of the Urethra and Bladder 824
Anatomy and Physiology 825
Methods of Examination 829
Percussion 829
Palpation 829
Catheter and Sound 830
Inspection 830
Urethroscopy 830
Cystoscopy 830
Malformations and Diseases of the Urethra 845
Congenital Malformations 845
Partial or Complete Absence 845
Atresia 845
Displacement 846

Malformations and Diseases of the Urethra:
Epispadias . . . 846
Hypospadias . . . 846
Acquired Malformations . . . 846
Dilatation . . . 846
Stricture . . . 847
Dislocations . . . 848
Prolapse of the Urethral Mucous Membrane . . . 848
Urethritis . . . 848
Acute . . . 849
Chronic . . . 849
Newgrowths of Urethra . . . 850
Caruncle . . . 851
Fibroma . . . 851
Carcinoma . . . 851
Sarcoma . . . 851
Foreign Bodies . . . 851
Diseases of the Bladder . . . 852
Developmental Deformities . . . 852
Vesical Fissure . . . 852
Double Bladder . . . 853
Loculate Bladder . . . 853
Malpositions and Malformations . . . 853
Eversion . . . 855
Hernia . . . 855
Foreign Bodies . . . 855
Cystitis . . . 857
Hyperemia . . . 864
New Formations . . . 864
Myoma . . . 864
Fibroma . . . 865
Papilloma . . . 865
Adenoma . . . 865
Dermoid Cysts . . . 866
Carcinoma . . . 866
Sarcoma . . . 866
Diseases of the Ureters . . . 869
Anatomy and Physiology . . . 869
Methods of Examination . . . 870
Palpation . . . 870
Inspection . . . 870
Catheterization . . . 870
Examination of Urine . . . 873
Congenital Anomalies . . . 874
Inflammations of the Ureter . . . 876
Obstructions of the Ureter . . . 878
Ureteral Calculus . . . 881
Stricture . . . 883

CHAPTER XXXIII

Post-operative Treatment

Responsibility for Complications . . . 886
Stimulation . . . 888
Position of Patient . . . 889
Relief from Pain . . . 890
Nourishment . . . 891
Evacuation of Bladder . . . 891
Care of the Bowels . . . 893
Application of Ice to Abdomen . . . 893
Duration of Convalescence . . . 894
Early Rising . . . 894
Abdominal Supporters . . . 896

CHAPTER XXXIV

Complications Following Operations

Surgical Shock . . . 897
Pulmonary Embolism . . . 902
Ileus . . . 903
Pneumonia . . . 906
Acute Bronchitis . . . 907
Postoperative Pleurisy . . . 907
Gangrene of the Lungs . . . 908
Abscess of the Lungs . . . 908
Pulmonary Edema . . . 908
Local and General Infections . . . 908
- Peritonitis . . . 909
- Fermentation Fever . . . 909
- Septic Intoxication . . . 910
- Septicemia . . . 910
- Pyemia . . . 911

Breaking of Stitches . . . 911
Postoperative Hernia . . . 913
Postoperative Hematemesis . . . 916
Retention and Suppression of Urine . . . 917
Postoperative Neuroses . . . 917
- Hysteria . . . 917
- Neurasthenia . . . 917
- Insanity . . . 917

Tympanites . . . 918
Phlebitis . . . 920
Acute Dilatation of the Stomach . . . 921
Vomiting . . . 921
Postoperative Cystitis . . . 922
Acute Nephritis . . . 924
Traumatic Fistulæ . . . 924
- Ureteral Fistulæ . . . 925
- Vesical Fistulæ . . . 925
- Rectal Fistulæ . . . 925

Pressure Paralysis . . . 925
Burns . . . 925
Emphysema of the Abdominal Walls . . . 925
Poisoning by Drugs . . . 925
Infectious and Contagious Diseases . . . 926
Diarrhea . . . 926
Bed-sores . . . 926
Acid Intoxication . . . 926
Ophthalmia . . . 927
Late Chloroform and Ether Poisoning . . . 927
Irregularities of the Pulse . . . 927
Excessive Pain . . . 927
Variations in Body Temperature . . . 928
Secondary Hemorrhage . . . 928
Foreign Bodies Left in the Abdominal Cavity after Operation . . . 930

DISEASES OF WOMEN

CHAPTER I

THE CLINICAL HISTORY—HEMORRHAGE FROM THE GENITAL TRACT

Clinical History
Form of Case Record

The Clinical History.—In the making of a diagnosis the first important step is the recording of a clinical history. A carefully recorded history has many advantages; it serves as a guide to a systematic examination, and places before the physician a detailed, logical record of the case for future reference.

It is manifestly impossible always to follow a set form in case-taking, neither is it possible always to adhere to the very good general rule of taking the full history at the time of the first examination.

The nervous state of the patient, together with many other factors, may preclude the taking of a complete history at the time of the first consultation, but on each occasion certain definite items may be recorded, and the history completed at a subsequent visit.

It is well to begin with permitting the patient to recite her complaints without interruption. The patient becomes self-possessed, while at the same time the physician is given an opportunity to observe her general appearance, temperament, complexion, nutrition, carriage, and many other points bearing upon her case. After a time direct questions may be put to her, and as the answers are given they may be concisely placed on record.

Form of Case Record.—In all text-books students are given a blank form to be filled out in the taking of a history. Such forms are of great service to the inexperienced practitioner, but for one who through long experience has acquired the art of case-taking they are unnecessary and ill-adapted. The allotted space may be inadequate to suit individual requirements. The card-index system is gaining favor and is highly commendable. The author prefers his letter-head, upon which the answers to questions can be hurriedly jotted, and to which subsequent notations can be added. This is placed in an envelope, on which

is recorded the name and address. These envelopes can be filed away in alphabetical order. Notes from all subsequent examinations, copies of prescriptions, correspondence with patient and physician, can all be placed in the envelope from time to time. When visiting the patient the envelope can be placed in the pocket and referred to on the way.

As a compromise between the elaborate printed forms and the blank letter-head, the following form is recommended for simplicity, accuracy, and liberal spacing:

Name	Address	Date
Patient of Dr.	Address	
Age	Occupation	Nationality
S. M. W.	Para	Miscarriages

Personal habits.

Events following childbirths and miscarriages.

Family history.

Previous illnesses.

Present complaints.

Menstrual history.	Menses began	Type
	Quantity	Duration
	Pain	Menopause

Uterine hemorrhage.

Menstrual pain.

Intermenstrual pain.

Leucorrhea.

General physical findings.

Urinary system.

Urinalysis:

Amount in twenty-four hours	Color	Sp. gr.
Reaction	Albumin	Sugar
Total solids	Urea	Microscopic

Physical findings in pelvis and abdomen:

Abdominal wall	
Tender on pressure	Swellings
Visceroptosis	

Pelvic floor.

Vagina.

Cervix.

Uterine body.

Tubes

Ovaries.

Urethra.

Bladder.

Rectum.

Appendix.

Extragenital structures.

Diagnosis.

Treatment.

Termination.

A discussion of the different items will be of practical interest.

Address.—The place of residence is inquired into, not only as a matter of business, but also to determine the possible influence of the environment upon the general health of the individual. Malarial districts, congested portions of the city, extremely warm or cold climates and high altitudes exercise a definite influence upon the general and local condition of a woman.

Without a favorable environment it is difficult to get desired results in the treatment of many of the diseases affecting women. The local conditions may be corrected, but if the place of residence and occupation are not favorable to the general well-being the results will be disappointing. This is clearly demonstrated in the speedy convalescence of patients who pass their convalescing days far removed from home and hospital where they find rest, healthful exercises, and new associations.

Age.—The special disturbances found in the various stages of life—*i. e.*, infancy, puberty, sexual maturity, climacteric and postclimacteric—are at once suggested when the age of the patient is known.

In infancy, malformations and inflammations of the lower genital tract are to be looked for; tumors, displacements, and traumatisms seldom appear. Infections rarely extend beyond the vagina. More often they are limited to the vulva by the hymen, which serves as a barrier.

At puberty, malformations of the genital organs are commonly first noticed through failure of the menses to appear; congenital displacements first cause disturbance at this time, because of the increase in the size of the uterus and the establishment of menstruation; inflammations are usually confined to the vulva, rarely extending above the hymen, while new-formations and traumatisms are seldom observed.

During the period of sexual maturity all lesions of the genital organs may be found. Congenital malformations may first be observed after marriage and in childbearing. Inflammatory lesions, involving part or all of the genital tract, most often arise as the result of childbearing,

specific infection, and instrumental and digital manipulations. New-formations usually make their appearance in this period. Displacements and traumatisms occur as the result of childbearing and rarely arise at any other time of life.

In the climacteric and postclimacteric periods all disorders have a special clinical significance. The possibility of malignancy should always be borne in mind. After seventy it is unusual for any lesion to develop. No disorder should be regarded lightly when arising at the end of the childbearing period. The onset of malignant disease is so insidious and so misleading in its clinical manifestations that no physician can afford to look lightly upon any disorder, however trivial it may seem to the patient and physician.

Occupation.—Occupation is an important factor in the causation and aggravation of pelvic disorders. In young girls confined to workshops the menstrual functions are seldom perfectly established. Poor ventilation, long working hours, heavy lifting, and poor food exercise an unfavorable influence upon the development of the pelvic viscera and tend to aggravate existing maladies. On the other hand, sedentary and indolent habits are equally injurious.

While it is true that occupation is essential to health, it is also true that every employment involves danger to health. This applies to those who work with their brains as well as to those who perform manual labor. Undue exposure to heat and cold in the open air may be equally as injurious as prolonged confinement in poorly ventilated rooms. Girls who are subject to such unhygienic conditions become delicate, anemic, and suffer from various nervous disorders, and in time become unfit to assume the responsibilities of motherhood. The constant sitting position, combined with a bending forward assumed day after day and for hours at a time by girls in shops, factories, and offices, engenders a pelvic congestion which leads to menstrual disorders of various types.

Strassmann calls attention to the very large percentage of machine-operators who suffer from pelvic inflammation. Occupations which demand prolonged standing bring their penalty in many ways. In the young girl whose pelvis is not fully developed, certain pelvic deformities may result which in turn may give rise to serious trouble in future childbirths. Kottnitz has observed the frequency of flat pelves in women who were never the subject of rickets but who began at an early age to work in weaving mills. It is a well-established fact that preëxisting gynecological disorders are aggravated by long standing.

Prolonged and severe exertion, early in life, leads to maladies which may make women totally unfit for wives and mothers and subject to anemic, nervous, and menstrual disorders. Overwork for one individual may not be overwork for another, but in general every woman is overworked who toils by day in shops and factories and undertakes to perform the duties of the home in the early morning and evening hours. While we would not deny women the privilege of work, we should see to it that they do not exceed the eight-hour-day limit, that they are

not compelled to work Saturday afternoons and Sundays, and that every hygienic safeguard is placed about them. Women in the latter weeks of pregnancy should not be permitted to work outside the home. This, of course, is possible only by giving them compensation for the loss of wages incurred.

No considerable improvement in the influence of industrial life upon the health of women can be looked for until health comissioners are empowered to make rigid inspection and are given the power to enforce sanitary conditions. This inspection should embrace the home, the school, the shops, and the factory. Wherever women are brought in close contact with one another, there is always a call for improvement in personal and general hygiene.

Nationality.—The Jewish race is said to menstruate early and to early reach the menopause, but the author knows of no definite evidence to this effect. The Caucasian race is more subject to carcinoma, the African to fibroids.

Social State.—It is well to inquire into the social state of the patient —to learn whether she is single, married, or a widow. An early understanding may forestall an embarrassing question as to the sexual relations, and may suggest possible causes for her complaints. For example, a recently married woman complaining of leucorrhea and painful urination is suspected of being infected. The fact that the patient is single or a widow should never mislead the examiner in his diagnosis; the possibility of pregnancy and venereal infection must always be excluded by the usual methods of examination, uninfluenced by the social state of the patient. While the physician must be alert to these possibilities, he should exercise great tact and caution in his inquiries.

Number of Children and Miscarriages.—Frequent childbearing and miscarriages almost certainly result in some sort of pelvic ailment. It is exceptional for a woman to give birth to several children without acquiring a pelvic lesion. Complaints dating back to a childbirth or miscarriage suggest the probable finding of an inflammatory lesion, a displacement, or a laceration.

General Predisposing Conditions.—The condition of the bowels and bladder, the cardiovascular, nervous, and respiratory systems, should be carefully inquired into.

Not infrequently a pelvic lesion is dependent upon a disorder of the abdominal or thoracic viscera. Dysmenorrhea, leucorrhea, uterine hemorrhage, and sterility may be directly referred to a general disturbance. An excitable and overwrought nervous system alone may be responsible for many of the functional disorders of the pelvic viscera. Regard for the general condition of the patient and a due appreciation of the influence of the general upon local conditions will do much toward eliminating so-called "meddlesome gynecology."

Family History.—It is improbable that heredity plays an important role in the etiology of pelvic disorders. In tuberculosis, and to a lesser degree in carcinoma, the influence of heredity should not be under-

estimated; but in the benign tumor formations, displacements, and malformations, heredity has little or no influence. It is well to inquire carefully into the family history, but its influence should not be overestimated.

Previous Illnesses.—Acute infectious diseases, tuberculosis, and all chronic wasting diseases, anemias, and long-standing lesions of the thoracic and abdominal viscera may both originate and aggravate disorder in the genital tract.

General conditions have an important bearing upon the pelvic viscera, not only in aggravating the disorders, but in actually originating them. It therefore becomes imperative to consider carefully all general conditions in relation to their possible bearing upon functional disturbances and lesions of the genitalia.

Present Complaints.—The complaints of the patient will often serve as a suggestion, but a diagnosis can never be based upon subjective symptoms in the absence of a physical examination. Any or all of the pelvic disorders may exist without subjective symptoms. On the other hand, there may be serious complaints on the part of the patient in the absence of a pelvic lesion. The familiar group of symptoms—hemorrhage, pain, leucorrhea, constipation, and backache—are common to many altogether dissimilar lesions in the pelvis. Little reliance can be placed upon the complaints of the patient, but the diagnosis must depend in great part upon the physical findings. Symptoms, at best, are only suggestive of a possible lesion.

Menstrual History.—So far the patient has been considered from the standpoint of the general practitioner. It is now necessary to consider more particularly the disorders of the genital organs.

HEMORRHAGE FROM THE GENITAL TRACT

Hemorrhage from the Vulva
Hemorrhage from the Vagina
Hemorrhage from the Cervix
Menstruation
- Time of Onset
- Frequency
- Quantity
- Anatomy of Menstruating Uterus
- Tubal Menstruation
- Menstruation without Ovaries

Uterine Hemorrhage
- Systemic Causes
- Local Causes
- Character of Discharged Blood
- Treatment

In diseases of women the most significant of all symptoms is *hemorrhage*. While not in itself diagnostic, it is of the greatest value as an indication for an immediate and searching physical examination, both general and local. Hemorrhage from the genitalia comes from the vulva, vagina, cervix, body of the uterus, and occasionally from the tubes; never from the ovary except in the case of a tuboövarian hematoma discharging its contents into the uterus—a most unusual event.

Hemorrhage from the Vulva.—This is the result of trauma, new-formations, ulcerations, lupus, cancroid, and rupture of varicose veins complicating pregnancy. The origin of the bleeding is recognized by direct inspection.

Hemorrhage from the Vagina.—This is due to causes similar to those already enumerated. An exceptional cause lies in metastatic growths of syncytium (syncytioma malignum). The bleeding site is readily disclosed by the vaginal speculum.

Hemorrhage from the Cervix.—From the *vaginal portion of the cervix* hemorrhage follows immediately upon the delivery of the child as the result of lacerations. At the end of the childbearing period the most common cause of hemorrhage from the cervix is carcinoma. Less frequent causes are sarcoma, tuberculosis, syphilis, and erosions.

Before considering the morbid conditions causing bleeding from the uterus, certain conditions which may be looked upon as a physiological uterine hemorrhage must be considered.

Menstruation.—No other organism loses so much blood from the uterus as does woman. Within certain ill-defined limits this loss of blood is physiological; hence it is important to consider first of all the character of the normal menstrual act before taking up the discussion of pathological bleeding from the uterus.

Time of Onset.—The time of onset of the menstrual function varies widely among individuals. Climate has much to do with determining the onset, and heredity has some influence. In this country Engelmann found the average age to be fourteen, in cold climates sixteen, and in warm climates nine years. Later observations made by Engelmann led him to the conclusion that early puberty is the rule in Arctic regions rather than at the equator. He observed that nutrition and habitation and a lascivious life, with early and constant mingling of the sexes, might appear to explain the early puberty of the Eskimo.

Precocious Menstruation.—Precocious menstruation is a condition that occurs occasionally. The earliest case occurred in Glasgow at four days of age. Irion records a case at seven days, and the literature abounds in cases a few weeks and months of age. In nearly all these cases the genitalia were abnormally developed; there was hair on the pubis, and the breasts were often enlarged. Precocious menstruation without premature development of the menstrual organs is improbable, and when this development is not found the hemorrhage should not be regarded as catamenial unless it recurs at monthly intervals. The mother will bring to the physician a napkin marked by a red stain, and will ask whether it is possible that her child is menstruating. Such stains may be blood from a vulvovaginitis or urethritis, but are more often deposits of red urates or uric acid. City-bred girls menstruate six to twelve months earlier than girls living in the country (Williams).

Frequency of the Menstrual Period.—It is often stated that the normal type is twenty-eight days, but women are rarely so regular; there is usually a variation of one or more days. Regularity in the menstrual functions adds neither strength nor grace. Women menstruate at long or short intervals without ill-effect, providing the quantity of blood lost does not materially lessen their strength.

Quantity.—The average quantity of menstrual blood lost in a single period is estimated at from six to eight ounces—the minimum two and the maximum ten. Obviously what may be regarded as a normal quantity for one may be abnormal for another. A plethoric, well-nourished woman may menstruate freely for eight days without harm, while the same loss of blood in an anemic individual might seriously undermine her strength.

It is impractical to collect the menstrual blood; therefore the amount of blood lost is estimated by counting the number of napkins soiled. No exact information is gained by this procedure because the size and quality of the napkins vary, and one woman will tolerate an oversaturated napkin, while another will scarcely permit the staining. However, no better means is at command, and by estimating the usual number at fourteen napkins in the entire period a fair estimate of the amount of blood lost during the menstrual period can be obtained.

Anatomy of the Menstruating Uterus.—Kundrat and Engelmann were the first to record anatomical observations on the menstruating uterus. These observations were made on cadavers in which the endometrium of the uterine body had undergone fatty degeneration and the surface epithelium was exfoliated.

Later, Williams made postmortem examinations of twelve menstruating uteri. Nine of the twelve patients died of acute infectious diseases. Like Kundrat and Engelmann, he found fatty degeneration of the mucosa of the uterine body, and stated that the entire mucosa down to the musculature was exfoliated, and that after menstruation the mucosa was regenerated from the musculature.

Leopold recognized the observations of Kundrat, Engelmann, and Williams as faulty, in that the changes in the endometrium as described by them might result from the acute infections and chronic wasting diseases which were the causes of death. He carefully excluded all such cases and selected those of normal menstrual type. He failed to observe fatty degeneration of the mucosa, but agreed that the surface epithelium was shed in the menstrual process. He does not state how long after death the sections were made, or the method of preparing the specimens. Within a few hours, certainly within twenty-four hours after death or hysterectomy, the surface epithelium undergoes degenerative changes and may be wholly lacking in microscopic sections unless the tissues are immediately fixed in formalin or some other fixing fluid.

It was Möricke who first excluded the possibility of postmortem and postoperative changes in the uterus by examining scrapings from the normal menstruating uterus. He curetted and made microscopic examination of forty-five menstruating uteri in all stages of menstruation. In every instance the surface epithelium was found intact. In two additional cases Löhlein reported similar findings.

Westphalen also made a series of examinations of scrapings of the mucosa during the various stages of menstruation. In every case in which the mucosa was normal the entire membrane was well preserved;

in morbid conditions of the mucosa part or all of the surface epithelium was shed. Mandle confirmed these findings.

The most elaborate observations were made by Gebhard in Berlin. He not only examined scrapings, but also sections of uteri removed during the menstrual period for lesions not involving the endometrium.

Stages.—He divides the anatomical changes into three stages:

The Stage of Premenstrual Congestion.—The capillaries of the mucosa are congested; a serous or serosanguineous exudate infiltrates the stroma of the mucosa, widening the intercellular spaces; later the blood leaves the capillaries and infiltrates the stroma, gravitating in the direction of least resistance—*i. e.*, toward the uterine cavity, and forming a collection of blood beneath the surface epithelium.

The Stage of Active Hemorrhage.—The blood is forced between the epithelial cells into the uterine cavity; here and there the epithelium is lifted from its bed, the continuity of the surface is broken, and bits of epithelium are accidentally broken off and carried with the menstrual flow. Blood may also find its way into the gland lumina.

The Stage of Postmenstrual Involution.—The bloodvessels become less engorged; blood is no longer extravasated into the connective-tissue spaces; the blood left in the stroma is slowly absorbed; the surface epithelium lifted from its bed resumes its former place, and lost epithelium is rapidly regenerated from adjacent epithelial surfaces.

Hitchmann and Adler divide the monthly cycle into four phases: First, the *postmenstruum*, which corresponds to the normal endometrium, in which the glands are small, regular, and round on cross-section, the epithelium narrow with large oval nuclei, and the connective tissue of round and spindle cells densely packed. Second, the *interval* in which the glands assume a corkscrew-shape, the epithelium is lengthened and contains a superabundance of protoplasm. Third, the *premenstruum*, in which the mucosa becomes thick and velvety, and in which three layers are distinguished, the superficial, compact, and spongy. The glands are irregularly convoluted, the epithelium is thrown into folds, and presents feathery projections. The interglandular spaces are filled with large stroma cells, not unlike decidual cells. Fourth, the phase of *menstruation* in which blood is noted in the stroma and on the surface, as described above.

It will be observed that these histological changes are identical to those found in hypertrophic glandular endometritis, and it is altogether probable that the menstrual changes in the endometrium are often mistaken for endometritis—a fact so clearly brought out by Hitchmann and Adler.

Nine hysterectomies were performed by Dr. Webster and one by the author during the various stages of menstruation.

Immediately upon removal the uterus was placed in salt solution, then placed in Zenker's solution for twenty-four hours. Sections were then made from various parts of the endometrium, tubes, and cervix; they were then carried through the usual technic in preparing celloidin sections.

In six cases examined by the author the tubes showed no changes, and the cervix was somewhat congested. The anatomical changes characterizing menstruation were confined to the mucosa of the uterine body in six cases, while in the other three there were similar changes in the Fallopian tubes. These observations establish the fact of tubal menstruation.

While knowledge of the physiology of menstruation is far from exact, a number of well-established facts relating to the anatomy of the menstruating uterus are known. Möricke, Mandle, Gebhard, Herzog and others have demonstrated beyond dispute that menstruation is not a shedding process, that the loss of epithelium is purely accidental and limited. Previous observations were at fault in the technic of preparing the sections, and in the selection of material which had undergone cadaveric changes and degenerative changes common to infectious and chronic wasting diseases.

Tubal Menstruation.—It has been the consensus of opinion that the Fallopian tubes do not take part in the menstrual act. A few cases have been observed in which blood collected in the tube during menstruation, but it is not proved that in these cases the blood came directly from the mucous membrane of the tube and not from the uterus. The author has observed the same histological changes during the menstrual period in the tubes and in the uterus. These changes were seen in three cases of the nine examined. From these observations the author is convinced that the Fallopian tubes menstruate in a small proportion of cases.

In the three instances referred to the identical changes were found in the mucous membrane of the tube that were found in the endometrium. The tubes were perfectly normal in every respect. J. M. Baldy, of Philadelphia, observed a complete inversion of the uterus in which the endometrium failed to bleed during the menstrual period, but at this time blood escaped from the uterine ends of either tube. J. Riddle Goffe observed blood issuing from the tubes during menstruation, and is of the opinion that the tubes occasionally menstruate. That the Fallopian tubes menstruate in a small proportion of cases would appear evident from these clinical and histological observations.

Menstruation without Ovaries.—Menstruation has been known to appear at regular intervals and for a considerable period of time after the removal of both ovaries. The theories advanced in explanation of this phenomenon are by no means convincing.

Supernumerary and Accessory Ovaries.—This will probably account for a large proportion of cases. Meriel found aberrant ovarian tissue in 4 per cent. of female bodies of all ages. These bodies varied in size from that of a millet-seed to a cherry, and were found near the anatomical ovary or remote from the parent ovary in the broad ligament, ovarian ligament, pelvic pouches, under the peritoneum, adjacent to the ureter or adherent to the omentum or intestine.

Persistence of the menstrual cycle by virtue of an established "habit."

Unknown Causes.—There is strong presumptive evidence that the ovaries are not essential to menstruation; that other factors, as yet unknown, may operate in exciting the menstrual flux in the absence of the ovaries. There is much need for further investigation of the subject.

Uterine Hemorrhage.—Text-books discuss menorrhagia and metrorrhagia—the former term applies to an abnormal increase in the menstrual flow, and the latter to an intermenstrual flow. These terms should be eliminated from common usage because of the impossibility of distinguishing between the two in many cases. The one so often merges into the other in such a manner as to render impossible a distinction between a menstrual and an intermenstrual flow. Then, too, they are dependent upon the same general causes. For the sake of simplicity and exactness, both are here included under the general head of uterine hemorrhage.

Systemic Causes.—Hemorrhage from the uterus may occur as the result of general systemic disturbances in the absence of a local lesion.

Anemia and Plethora.—Anemia and plethora may cause hemorrhage—anemia by reason of the low specific gravity of the blood and its diminished coagulability, and plethora from high vascular pressure. Chlorosis is the exception among the anemias, in that the menstrual flow is lessened or absent. Anemia is commonly spoken of as the result of uterine hemorrhage, when, as a matter of fact, it is not seldom the underlying cause.

The author operated upon a case diagnosticated by Dr. B. W. Sippy as splenic anemia, in which a perfectly normal uterus bled excessively every three weeks. Removal of the spleen resulted in a rapid restoration of the blood and the disappearance of the uterine hemorrhage. Failure to check uterine hemorrhage by ergot and curettage is frequently accounted for by failure to recognize possible general causes.

Purpuric Conditions.—All purpuric conditions may be accompanied by hemorrhage from the uterus as well as from other parts of the body.

Infectious Diseases.—The specific infectious diseases may be complicated by hemorrhage from the uterus brought about by blood and vascular changes, and acquired insufficiency of the uterine musculature.

Emotion.—It is said that emotion will excite a hemorrhage from the uterus. The accuracy of this statement is doubtful; in his own experience the author has never seen the uterus bleed after a period of mental excitement in which there was not found a pathological lesion to account for the loss of blood. The mental disturbance serves only as an exciting cause of the hemorrhage, but without a pathological lesion there would be no hemorrhage.

Passive Congestion.—Whatever impedes the return flow of blood from the uterus will bring about passive congestion in that organ, which in turn may result in hemorrhage. In this category may be mentioned displacements of the uterus, diseases of the heart, lungs, liver, kidney, and spleen, abdominal tumors, ascites, and, lastly, chronic constipation.

Many an otherwise insignificant local lesion, such as a mucous

polyp, would probably cause little or no bleeding were it not for the passive congestion of the pelvis brought about by such factors.

Local Causes.—Subinvolution.—Subinvolution of the uterus, the result of postabortive and puerperal infection, may be regarded as the most prolific source of pelvic disorders in the female. It is the starting point of many displacements and inflammations which eventuate in uterine hemorrhage. The uterus is enlarged in all its diameters, and is deeply congested. Such an organ rarely maintains its position because of an increase in weight and a lack of support from the ligaments and pelvic floor, which have been stretched and torn in labor. The usual factors in the development of subinvolution are early rising from childbed, traumatisms in labor and infection following labor, and abortion. In this connection it is to be remembered that retained placental tissue will result in subinvolution of the uterus, and may remain organically attached to the uterus for days, months, and even years, keeping up irregular hemorrhages.

The essential factor in the causation of hemorrhage from a subinvoluted uterus lies in insufficiency of the musculature of the myometrium rather than in the endometrium.

Endometritis.—Endometritis is commonly recognized by the symptoms—hemorrhage, pain, and leucorrhea. One or all of these symptoms may be absent, and the diagnosis must finally rest upon the microscopic examination of scrapings from the endometrium. *Indeed, a positive diagnosis of endometritis can be made only by the microscope.* When hemorrhage exists it is usually in the form of an increase in the menstrual flow—rarely as an intermenstrual flow. Olshausen has described a lesion which he calls fungus endometritis, and bases his clinical diagnosis upon the presence of hemorrhage in the absence of pain and with little or no leucorrhea. The endometrium is greatly thickened and thrown into folds and fungous-like masses, which, under the microscope, are seen to consist of a meshwork of enlarged and greatly distended glands, with but little interglandular connective tissue. Another variety of endometritis, usually resulting in a profuse menstrual flow, is the polypoid. The author believes that hemorrhage is seldom the direct result of endometritis but rather of a deeper seated lesion; one that has engaged the attention of gynecologists in the past decade. (See Muscular Insufficiency.)

Para-uterine Inflammations.—Para-uterine inflammations are usually associated with inflammation of the uterus, but may in themselves provoke uterine bleeding. The author has repeatedly drained a pelvic abscess without curetting the uterus, and has seen the hemorrhages from the uterus disappear with the subsidence of the parauterine exudate.

Mucous Polyps.—Mucous polyps of the uterus are generally of inflammatory origin. Some authors believe them to be invariably of inflammatory origin, while all admit that they are in large part so. Polyps generally produce profuseness of the periods, though hemorrhage is not an invariable symptom, and their presence may be accidentally

discovered by the curet or after the removal of the uterus for other reasons.

Uterine Fibroids.—In general, it may be said that uterine fibroids of whatever variety can only cause hemorrhage from the uterine cavity when the tumor involves the endometrium. Fibroids rarely bleed; the hemorrhage comes from the endometrium.

Sampson has made most interesting observations on the blood supply of fibroid tumors of the uterus and has drawn certain practical deductions as to the cause of hemorrhage in these cases. The veins were injected with gelatin containing ultramarine blue and the arteries with gelatin colored with Venetian red. In about half the cases the injection consisted of gelatin and bismuth for the purpose of making *x*-ray examinations.

By means of the arterial injections, Sampson was able to demonstrate the arterial blood supply in all but a few of the smaller tumors. In large tumors the arteries were often enlarged and apparently increased in number. Not infrequently the large tumors were more vascular than the surrounding musculature. The arterial system of the tumors appeared to be of two chief types of arrangement; there being a diffuse distribution of intrinsic vessels, extending in all directions within the tumor and a marked development of arterial trees with communicating branches and roots.

The injected veins showed the tumor to be poor in veins and the endometrium rich in veins. The blood lost in uterine fibroids, according to Sampson, largely comes from the venous plexus surrounding the tumor. One or more branches of the arcuate arteries of the uterus supply the tumor and are called nutrient arteries; the tumor is enveloped by these branches and penetrated by them. Arterioles in the tumor and immediately surrounding it may communicate; this Sampson believes to be a secondary development.

Fibrous Polyps of Cervix.—The author has observed a number of cases of postclimacteric hemorrhage caused by fibrous polyps of the cervix. It appears that such polyps are prone to develop at this time of life.

Carcinoma and Sarcoma.—One of the earliest symptoms of cancer and sarcoma of the uterus is hemorrhage. Yet these growths may be far advanced before hemorrhage or any other symptom is manifest. For this reason malignant diseases of the uterus are often not observed in time to effect a radical cure. When hemorrhage does make its appearance it is too often looked upon as an irregularity of the menopause. *The statistics in carcinoma of the uterus would be greatly bettered if all hemorrhages occurring at the time of the menopause and after this period were viewed with suspicion, and the cause sought for, rather than that all irregularities be ascribed to the menopause.*

Syncytioma Malignum.—There is a malignant growth to which only a brief reference is here necessary. It is usually called syncytioma malignum, and is a malignant degeneration of placental tissue. Hemorrhage is the earliest symptom, and it may be laid down, as a rule,

that when an irregular hemorrhage follows late upon childbirth, hydatid mole, or abortion, the possibility of malignant degeneration of placental tissue must be borne in mind. The diagnosis can only be determined by an exploratory curettage and microscopic examination of the scrapings, together with a consideration of the clinical course. (See Chapter X.)

Cystic Degeneration of the Ovaries.—This is an occasional cause of uterine hemorrhage. Kelly says that hemorrhages from the uterus of ovarian origin have been known to prove fatal. On several occasions the author has checked uterine bleeding by resecting cystic ovaries without curetting the uterus or in any way directly altering its conditions. Such cysts of the ovary commonly develop from the corpus luteum.

Pelvic Hematoma.—What has been said of pelvic inflammatory exudates will apply to accumulations of blood within the pelvis. When the blood is evacuated the hemorrhages from the uterus are often seen to disappear.

Obstetrical Causes.—It is necessary only to refer to *placenta prævia, hydatid mole, premature detachment of the placenta,* and *ectopic pregnancy* as causes of uterine hemorrhage.

When hemorrhage occurs during or immediately after the third stage of labor it is possible that placental tissue is retained in the uterus, or that the uterus is relaxed from fatigue and overstretching.

Improbable as it may seem, death from hemorrhage rarely follows rupture of the uterus, but it is more likely to occur from subsequent infection.

Pathological Menstruation.—The persistence of menstruation during pregnancy should be regarded as a morbid condition and not as a perverted physiological type, as it is generally thought to be. The author believes that there is a pathological lesion in every instance to account for the loss of blood.

Montgomery observed a case in which there was a profuse hemorrhage at the time of the first menstrual period following conception. The patient learned to regard the hemorrhage as evidence of her pregnancy. Baudelocque and Deventer reported cases in which the menses only appeared during pregnancy and ceased at its termination. The hemorrhage may appear at any month of pregnancy, but with greater frequency in the early months. In all such cases great caution should be exercised in the diagnosis of the cause of the hemorrhage. Before it can be regarded as menstrual blood a most searching examination must be made for the purpose of excluding such possible causes as placenta prævia, double uterus, fibroids, carcinoma, mucous polyps, and ectopic pregnancy.

Arteriosclerosis.—Arteriosclerosis alone has been held responsible for uncontrollable uterine hemorrhage by Herman, Martin, Reinecke, and Küstner. This cannot be wholly sustained, because in none of their cases is there a record of having excluded other possible causes

lying beyond the uterus. Reinecke and Martin performed hysterectomy in thirteen cases for the control of hemorrhage, and in all the removed uteri the arteries were found sclerosed; but they did not exclude the possibility of obstruction to the return circulation from such causes as diseases of the heart and lungs, thrombosis of the venous trunks, and portal congestion from whatever cause. The point is that in the light of twelve cases reported by von Kahlden, Popoff, Herxheimer, and Dietrich, and the one by the author, arteriosclerosis *per se* is alone insufficient to cause a hemorrhagic infarction of the uterine tissues or hemorrhage into the uterine cavity. In the eight cases reported by von Kahlden the postmortem findings showed anatomical hindrances to the general circulation in every case. There was pneumonia in two of the cases, pulmonary emphysema and bronchitis in three cases, cancerous infiltration of the lungs and liver in one case, pulmonary infarcts in another, and in four of the eight cases there were cardiac lesions. In the case of Popoff there were granular nephritis and heart thrombi, pleural effusion, and infarction of the lung and brain. In Herxheimer's case there was an hypertrophied heart and thrombi in the left ventricle and right auricle, granular nephritis, and atheroma of the aorta. In the author's case, hemorrhage did not occur until there was an additional obstruction to the circulation caused by the plugging of the uterine artery. It is, therefore, not conclusively demonstrated that arteriosclerosis can in itself be the cause of uterine hemorrhage. It would appear that there must be additional causes for obstruction, such as were found in the recorded cases.

In the so-called "apoplexia uteri," it is probable that the hemorrhages are not caused by the rupture of the bloodvessels, but rather are due to capillary oozing. This would account for the hemorrhagic infiltration being so removed from the sclerosed vessels in the cases of von Kahlden.

Etiology.—Respecting the etiology of arteriosclerosis of the uterine vessels and hemorrhagic infarction of the uterus, little can be said. Age varies within the limits of fifty and eighty-seven years. Pregnancy, menstruation, and inflammation of the uterus have some bearing upon the etiology. The causes of arteriosclerosis, *i. e.*, alcoholism, chronic malaria, chronic lead poisoning, syphilis, etc., that obtain elsewhere in the body, apply likewise to the uterus.

Frequency.—It is not unlikely that arteriosclerosis of the uterine arteries and hemorrhagic infarction of the uterus are often overlooked in clinical and postmortem examinations. It is probable that many cases of so-called "senile endometritis" and "hemorrhagic metritis of the menopause" are in reality hemorrhagic infarction of the uterus, and have as an underlying factor arteriosclerosis and calcareous degeneration of the uterine vessels. The fact that these cases occur in advanced years, that they may not be associated with leucorrhea, and that no cause may be found for the hemorrhages, either by clinical examination of the uterus and adnexa or microscopic examination of scrapings from the endometrium, would be strong evidence in favor

of the view that these cases are not infrequently hemorrhagic infarcts of the uterus and that the primary lesion lies in the bloodvessels.

Diagnosis.—When there is no demonstrable cause for the hemorrhage the cases are usually called endometritis. If an exploratory curettage is made with negative findings, the indefinite diagnosis of metritis will probably be given, particularly when the uterus is of dense consistency and uniformly increased in size. It is possible that the increase in the connective tissue of the myometrium may interfere with the circulation, but it is altogether certain that in many cases the primary cause lies in the walls of the bloodvessels, and the hyperplasia of the uterus is secondary. It is altogether probable that arteriosclerosis of the uterine vessels may exist without symptoms, and, as stated, there probably must be some additional obstruction to the return circulation in order to cause hemorrhage. This event alone is suggestive of the lesion. The clinical diagnosis is, therefore, at best uncertain. If hemorrhage occurs in the climacterium or near the time of the menopause, and no local cause for the hemorrhage can be found, either in the presence of newgrowths of the uterus and adnexa, in the position of the uterus, or in the microscopic examination of the uterine scrapings, then it is fair to presume that arteriosclerosis of the uterine arteries exists. If, in addition to this, there is found arteriosclerosis of the peripheral arteries of the body, and there exists a disease of the viscera to account for an obstruction in the return circulation from the pelvis, then it is fair further to presume that a hemorrhagic infarction of the uterus is present, and that the uterine hemorrhages are due to a hemorrhage into the tissues and cavity of the uterus. It is not probable that the sclerosed vessels will be found in the scrapings, because they commonly lie in the outer half of the uterine musculature. Caution must be exercised not to mistake the compressed glands for cancer nests.

Syphilitic Uterine Hemorrhage.—Jaworskl mentions eight cases of obstinate uterine hemorrhage of syphilitic origin. There is a syphilitic angiosclerosis of the uterus marked by a hardening of the uterus which may spread to the whole organ and even to the parametric tissues. As a rule, the bloodvessels are affected and the syphilitic arteritis of tertiary syphilis may be the most prominent, and indeed it may be the only uterine change. The loss of elasticity of the uterine tissue, together with the hardening of the uterine vessels, may give rise to frequent, copious, and obstinate bleeding from the uterus, both at the menstrual period and in any hyperemia of the uterus. He gives notes of five of his cases. In the first of these the hemorrhages had been excessive during three years, and three "cures" with saline baths and peat baths had done no good, nor had curetting of the uterus. At this time the man with whom the patient, an unmarried woman, cohabited came under treatment for tabes. Antisyphilitic treatment was now given the woman, with the result that the abnormal hemorrhages altogether ceased, and the uterus became smaller and also normal in consistency.

The symptoms which suggest tertiary syphilis of the uterus are not characteristic. The most constant symptom is the occurrence of uterine hemorrhages which resist local treatment and the next in frequency is an obstinate, offensive, mucopurulent discharge. The loss of blood always results in severe anemia, which may even proceed as far as cachexia. The uterus is usually increased in bulk, occasionally it is atrophic, its tissue is lacking in normal elasticity, and may be hard, sometimes almost of a cartilaginous consistency. A history of habitual abortion, usually at the same period of pregnancy, would be a great help to diagnosis. In the ulcerative forms of late syphilis of the uterus carcinoma of the uterus may be simulated.

MENOPAUSE.—*Finally, it may be said that the popular impression that the flow is increased in the climacterium leads to disastrous consequences. No increase in the menstrual flow at the time of the climacterium should be regarded as normal or of no clinical importance. A searching examination is imperative.*

Character of Discharged Blood.—The character of the discharged blood varies not only in amount, but in color and consistency; and from these characteristics something may be inferred as to the origin of the hemorrhage. The menstrual blood is usually thin and of a bright red to a dark brown color. Coagulation is hindered by the alkaline reaction of the uterine secretions. Coagulated menstrual blood is always abnormal.

Coagulation of the blood may occur in endometritis, uterine fibroids, carcinoma, polyps, and abortion. When the blood is of a dark, brownish-red color it is inferred that the passage of the blood has been obstructed, giving time for coagulation within the uterine cavity. When mucus is intimately mixed with the blood it indicates an involvement of the cervix from cervical catarrh, polyp, carcinoma, or sarcoma.

Blood of a syrupy consistency is supposed to have remained a long time in the uterine cavity. Tissue fibers mixed with the blood suggest the presence of degenerated newgrowths.

Treatment of Uterine Hemorrhage.—In the treatment of uterine hemorrhage, the fact must not be overlooked that certain conditions remote from the pelvis may be the essential or contributing factors in the causation of uterine hemorrhages, and therefore call for systemic treatment. Anemia, plethora, purpuric conditions, diseases of the heart, lungs, kidneys, and spleen, chronic constipation, all may induce excessive bleeding at the menstrual period, and the treatment should be directed to these conditions. The treatment of uterine hemorrhage is essentially the removal of the cause and is first medicinal, second mechanical, third surgical.

MEDICINAL TREATMENT.—For the control of uterine bleeding the drug *par excellence* is ergot. The physiological effect of ergot is to produce contraction of the uterine bloodvessels and muscle fibers. Hence it is chiefly applicable to atonic conditions of the uterus associated with loss of blood. It finds its greatest applicability in the hemorrhages following abortions and labor due to relaxation of the uterine muscu-

lature and will also promote involution of a subinvoluted uterus of recent development. Where the uterine musculature is degenerated or embarrassed by an excess of connective tissue, as in chronic metritis, ergot will have little effect in stimulating the contractions of the uterus. The fluidextract of ergot, given by mouth in 10-minim to 1-dram doses, will produce results in ten to twenty minutes. When there is need for more prompt action, ergotol in 5- to 30-minim doses may be given hypodermically.

Hydrastis acts upon the bloodvessels and musculature in the same manner as ergot and may be given in equal doses alone or in combination with ergot.

Styptol and stypticin are extolled as uterine sedatives and styptics. The author has not had as good results with these remedies as with ergot and hydrastis. They are given in 2- to 4-grain doses, three or four times daily. In the control of excessive menstruation they have some value and are also credited with having some sedative action in relieving pain.

Viburnum prunifolium, in doses of $\frac{1}{2}$ to 2 drams, has found favor particularly in the establishment of the normal menstrual flow.

Adrenalin is said to have a controlling influence over the menses. The dose is 10 to 15 drops of a $\frac{1}{1000}$ solution, given four times a day.

Calcium chloride may be given throughout the entire month in doses of 5 grains after each meal. During the menstrual period the same dose may be repeated at intervals of two hours.

℞—Calcii chlorid.	ʒv	20	
Glycerini q. s. ad	ʒiv	120	
Sig.—Teaspoonful three times daily.			

℞—Fl. ext. ergotæ	ʒiv	120	c.c.
Sig.—Half-teaspoonful every four hours.			

℞—Calcii chlorid.	ʒiij	12	
Ergotin.	ʒj	4	
Hydrastinin.	ʒj	4	
Div. in caps. no. xxx.			
Sig.—One capsule every four to six hours.			

℞—Stypticini	gr. xl	2	592
Ergotæ	gr. xl	2	592
Div. in caps. xx.			
Sig.—One capsule every four hours.			

℞—Hydrastinæ hydrochlorid.	gr. vii		454
Ergotin (Merck)	gr. xxx	1	944
Ext. nucis vomicæ	gr. iii		194
Div. in caps. no. xv.			
Sig.—One capsule every three hours.			

℞—Desic. thyroid	ʒj	4	
Div. in caps. no. xx.			
Sig.—One capsule five times daily.			

℞—Ergotin	ʒss		
Strychninæ sulph.	gr. ss		032
Ext. cannabis indicæ	gr. x		648
Div. in caps. no. xxx.			
Sig.—One capsule every four hours.			

℞—Ergotinæ,
Stypticini,
Hydrastininæ . . . . . āā ℥ss 2|
Fiat capsulæ no. xxx.
Sig.—One capsule every four to six hours.

℞—Ergotin . . . . . ℥ss 2|
Ext. nucis vomic. . . . . gr. vi 0|4
Fiat capsulæ no. xxx.
Sig.—One capsule every four to six hours.

Much has been written on the use of pituitrin in the management of uterine hemorrhage of obstetrical origin, but as yet the remedy has not been extensively used in gynecological conditions. Bab has had success in the control of hemorrhages due to metritis, endometritis and pelvic inflammation. The dose was 2 or 3 c.c. of pituitrin injected subcutaneously and repeated on several successive days.

The *x*-rays have been effectively applied to climacteric hemorrhages of metritic origin.

While employing the remedies mentioned the beneficent effect of *rest* must not be overlooked. *Rest is the first and most essential measure to employ for the control of uterine hemorrhage.* In girls who flow excessively it is well to enjoin rest throughout each menstrual period until the flow is regulated. This precautionary measure alone will often suffice for a cure.

Mechanical Treatment.—When the loss of blood is excessive or does not respond to medicinal treatment and rest, mechanical means must be resorted to for control of the bleeding. The following measures are in general use.

Vaginal Packs.—Vaginal packs, consisting of strips of plain surgical gauze, are used to pack the vagina tightly. The packing is done through a bivalve or trivalve speculum, using a dressing forceps for the purpose. Instead of surgical gauze, lambs' wool or absorbent cotton may be used, but not so effectively.

Uterine Packs.—Uterine packs are rarely used except in postabortive and postpartum hemorrhages. Sterile gauze in long strips is packed tightly into the uterus from the fundus down. This pack is allowed to remain for forty-eight hours. Strict surgical cleanliness must be enforced in the procedure.

Hot Vaginal Douches.—Hot vaginal douches are of special value in hemorrhages associated with pelvic congestion. The patient should be placed in the dorsal position. A Kelly pad or bed-pan will serve to collect the douche water. Not less than two gallons of water should be used, at a temperature of 112° to 120° F. These douches should be repeated once every four to twelve hours.

Hot Intra-uterine Douches.—Hot intra-uterine douches have been used in postabortive hemorrhages, but they have a limited field of usefulness and may do harm is dislodging emboli, in perforating the uterus, and in washing the fluid through the tubes into the abdominal cavity.

Ice-bags.—Ice-bags placed over the abdomen and lumbosacral region are of service when the hemorrhages are not excessive.

Intra-uterine Applications.—Intra-uterine applications of styptics are effectively used. The endometrium is swabbed with nitric acid (C. P.) or with the perchloride of iron.

Surgical Treatment.—Whatever may be the underlying cause of uterine hemorrhage the curet is the common resort with the profession in general. The curet is capable of much harm and should not be used by the ignorant or the careless. The subject is fully discussed on page 126, where its limitations are defined.

For the treatment of uterine hemorrhage dependent upon displacements of the uterus, metritis, subinvolution, pelvic inflammation, cystic ovaries, extra-uterine pregnancy, incomplete abortion, fibroids, cancer, sarcoma, syncytioma malignum, muscular insufficiency, arteriosclerosis, and other morbid states, the existing morbid conditions must be corrected or removed. These subjects will be discussed under their respective heads.

When the patient has lost blood to the extent of creating so grave an anemia as to render an operation under anesthesia hazardous, it is well to control the hemorrhage by tentative measures until the blood is sufficiently restored to justify operative interference. To this end rest in bed should be enjoined, a light but nourishing diet should be given, blood tonics administered, the uterus curetted, and the vagina packed with gauze. The author has repeatedly succeeded in improving the blood at the rate of 1 per cent. a day under this treatment, and thus speedily brought the patient to a safe condition for operation. Below 40 per cent. of hemoglobin, 2,000,000 red corpuscles, and a blood pressure of 100, it is not safe to perform a major operation. Nothing short of an emergency would justify surgical interference when the blood findings are below this point.

CHAPTER II

DISORDERS ASSOCIATED WITH MENSTRUATION—BACKACHE—ENTEROPTOSIS

DISORDERS ASSOCIATED WITH MENSTRUATION

Amenorrhea
- Physiological Absence of Menstruation
- General Causes
- Local Causes
- Menstrual Molimina
- Vicarious Menstruation
- Diagnosis
- Treatment

Pain in Pelvis during Menstruation (Dysmenorrhea)
- Primary
- Secondary
- Membranous Dysmenorrhea
- Nasal Dysmenorrhea
- Periodic Intermenstrual Pain (Mittelschmertz)
- Treatment
- Dysmenorrhea Due to a Conical Cervix

Amenorrhea.—Physiological Absence of Menstruation.—In determining the causes of amenorrhea it is well to bear in mind the physiological conditions in which the menses fail to appear.

1. Before puberty.
2. During irregular intervals at the time of the establishment of menstruation.
3. During pregnancy and a variable time in the period of lactation.
4. During the establishment of the climacterium—"dodging period."
5. After the menopause.

When the menstrual flow is retarded or when the quantity is less than normal the condition is known as *amenorrhea.* The term may be further qualified by the words relative and absolute.

By *relative amenorrhea* is meant a menstrual flow that is below the normal amount for the given individual. What is abnormal for one may be normal for another, depending upon the general condition of the individual.

By *absolute amenorrhea* is meant a total suppression of the menses.

The causes of amenorrhea are both general and local.

General Causes.—*Debilitating diseases,* such as primary anemia, diabetes, Bright's disease, tuberculosis, malaria, and nervous diseases, are contributing factors. Chlorosis is probably the most common cause of amenorrhea in girls. In determining the cause of amenorrhea it is not enough to establish the fact of anemia, but the character of the anemia must be ascertained by an analysis of the blood, and, if possible, the underlying cause must be demonstrated.

The secondary anemias are grouped according to general causes into

those due to deficient nutrition and those due to increased waste. Digestive and respiratory disorders limit the supply of blood and oxygen essential to the proper nourishment of the body, and, indirectly, to the performance of the menstrual functions.

Amenorrhea is not infrequently the first suggestion of the presence of an incipient tuberculosis. Formerly these cases were commonly regarded as chlorotic, inasmuch as the two affections present the same blood findings. Furthermore the same treatment, fresh air and abundant diet, with regulation of the bowels, is employed for both. It is encouraging to note that tuberculosis presents the more favorable prognosis, since genuine chlorosis is likely to be associated with defects in the bloodmaking organs, or with an abnormally small size of the heart and bloodvessels; conditions which cannot be remedied.

Change in environment conduces to constipation, and it is observed that by regulating the bowels these amenorrheics are more readily benefited than by any other process.

Hemorrhage from any part of the body, chronic diarrhea, continued suppuration, albuminuria, and the like, result in excessive waste that will bring about amenorrhea.

Changes in Environment.—These are often followed by amenorrhea for a variable length of time. Girls coming from foreign countries to the United States commonly experience a delay in the appearance of the menses for a variable time.

Mental Shock and Anxiety.—These may cause a suppression of the menses. The fear of conception may suppress the menstrual periods, and when the fears are allayed the menses may promptly return.

"Catching Cold."—This is a term in ordinary usage, implying a congestion of the pelvic viscera. Part or all of the menses may be suppressed by exposure to cold immediately before and during the menstrual period.

Acute Infectious Diseases.—Acute infectious diseases, including diphtheria, pneumonia, scarlet fever, and acute articular rheumatism, may be followed by a period of amenorrhea, and may result in permanent suppression of the menses through degenerative changes in the uterus and ovaries.

Nervous Diseases.—Nervous diseases, including melancholia, various forms of insanity, and imbecility, are not infrequently responsible for amenorrhea. In many instances the amenorrhea is thought to be the exciting cause of the nervous disorders.

Drug Addictions.—Morphinism is an occasional cause of amenorrhea. The same is said of alcoholism and lead poisoning.

Temporary Amenorrhea.—Temporary amenorrhea is not uncommon in young women as a result of worry and anxiety, change of residence, and mode of life. In every instance the possibility of pregnancy must be borne in mind, and when it cannot be positively excluded, the patient must be kept under observation until such time as positive signs of pregnancy would be manifest.

Following typhoid fever, diphtheria, scarlet fever, and other acute

infections the menses may not return for several months. Amenorrhea is an early accompaniment of pulmonary tuberculosis, a fact which has led to the impression among the laity that amenorrhea causes tuberculosis.

Disordered Functions of the Ductless Glands.—These constitute important factors in the development of amenorrhea, though as yet the problems connected with this subject are largely theoretical. When there is a lack of thyroid substance in the system, as occurs in myxedema, amenorrhea is usually a symptom. In exophthalmic goitre relative amenorrhea is sometimes observed, though as a rule the menstrual flow is increased. The first symptom of Addison's disease is likely to be amenorrhea. In acromegaly, when the pituitary body is atrophied, amenorrhea is usually present as one of the earliest symptoms. Cretinism is commonly associated with amenorrhea.

Local Causes.—*Congenital Absence of Organs.*—Congenital absence of the organs essential to menstruation, namely, the uterus and ovaries, is a rare causal factor.

Hypoplasia and Atrophy.—Hypoplasia and atrophy of the organs essential to menstruation, are often accompanied by chlorosis. Here the ovaries are primarily affected.

Atresia.—Retention of the menses occurs from atresia of the cervix and vagina, imperforate hymen, and tumor formations obstructing the outflow of the menstrual blood. (See Chapter XV.)

Atresic conditions of the vulva, vagina, and cervix are congenital in about one-third and acquired in about two-thirds of the cases. The acquired forms are the result of gonorrheal vulvo-vaginitis and the sequelæ of infectious diseases.

Puerperal ulcers of the vagina and vulva may lead to atresia, as may also extensive lacerations following labor. Ill-fitting pessaries worn over a long period are occasional factors. Application of caustics to the cervix and endometrium may induce amenorrhea through atresia.

Removal of Uterus and Ovaries.—Removal of the uterus or ovaries, doing away with the menstrual flow.

Diseases of Genital Organs.—Diseases of the genital organs which disable and destroy the tissues essential to menstruation—*i. e.*, metritis, endometritis, cystic degeneration of the ovaries and new-formations in the uterus and ovaries—are occasional causes of amenorrhea.

Adipostity Associated with Anemia.—The fault may rest primarily in the ovaries.

Amenorrhea without Apparent Cause.—The general and local conditions of an individual may appear perfectly normal in the presence of amenorrhea.

Effects of Ovariotomy on Menstruation.—In this relation it is interesting to note the effect of the removal of the ovaries upon menstruation. After both ovaries are removed, menstruation stops abruptly in 66 per cent. of cases. In the remaining 33 per cent., menstruation stops gradually throughout a period of one to six months.

The cause of uninterrupted menstruation after double ovariotomy

is explained by the presence of a supernumerary ovary or by the accidental leaving of a bit of ovarian tissue adherent to the neighboring structures. A small portion of the ovary may have been constricted off from the parent ovary by contracting bands of adhesions, and may escape notice in the removal of the ovary. The law of persistence of habit may explain an occasional case. More often a flow persists as the result of a uterine tumor or an inflammatory lesion, and is not, strictly speaking, a menstrual flow.

Menstrual Molimina.—The local and general disturbances which accompany the menstrual flow are designated as the *menstrual molimina*. These disturbances are pain in the region of the ovaries, in the back, and radiating to the thighs; also flushing of the face, dizziness, palpitation, and headache. The duration of these symptoms varies from a few hours to the entire month. The menstrual molimina generally begin about one month after the removal of the ovaries, and extend over a period of one or two years, sometimes much longer.

When the uterus alone is underdeveloped and the ovaries are sufficiently developed to functionate, there will be little or no flow of blood, but the other phenomena of menstruation which mark the condition known as the *menstrual molimina* appear at monthly intervals.

Vicarious Menstruation.—Vicarious menstruation is a discharge of blood at the menstrual period from some part of the body other than the uterus. These hemorrhages may occur simultaneously with the uterine menstrual flow, or in the absence of all bleeding from the uterus. Almost all mucous and cutaneous surfaces have been known to menstruate vicariously, notably the nose, stomach, intestines, and bronchi. The urethra, bladder, throat, conjunctiva, and ears bleed less frequently. Instead of blood, other discharges may take place. Cases have been recorded of periodical diarrhea, leucorrhea, and secretions of milk from the breast. Ulcers and cicatrices have been known to bleed at the menstrual period. A nevus on the face has been known to bleed simultaneously with the menstrual flow. The cervix was observed to menstruate by Ashton after the removal of the body of the uterus and ovaries.

Diagnosis.—The diagnosis of amenorrhea is made solely upon establishing the fact of the non-appearance of the menstrual flow. Such a diagnosis is of little value unless the cause of the amenorrhea is clearly established. Pregnancy must always be excluded before considering other possible causes, and in doing so it is often necessary to observe the patient for a limited period.

When a patient presents herself complaining of amenorrhea, her age will suggest the possible cause. If she is about the age of puberty, the irregularities which commonly mark the establishment of the menstrual function suggest themselves; if in the period of sexual maturity, the possibility of pregnancy is uppermost in the mind; and if at a later period, the menopause is suggested. Again, if the patient has never menstruated and has advanced beyond the age of puberty a defect in the development of the sexual organs is naturally suggested.

So varied are the causes of amenorrhea that without a searching

physical examination the diagnosis of the cause cannot be known, and without a diagnosis the treatment cannot be wisely directed, inasmuch as amenorrhea is but a symptom, and rational treatment is based upon the removal of the cause.

First of all the question must be determined as to whether the amenorrhea under consideration is physiological. The questions asked are: Is it time for the establishment of puberty? Is it possible for pregnancy to exist? Is the patient nursing a child? Is she in the dodging period of life? Has she reached the menopause?

All of these questions must be settled before it is possible to pass to a consideration of the many general and local conditions which may have a direct bearing upon the existing amenorrhea.

Having answered them in the negative a consideration of the systemic causes of amenorrhea is taken up. Is the patient suffering from or has she recently suffered from a debilitating disease, such as tuberculosis, malaria, nephritis, anemia, and digestive disorders? If so, the cause of the amenorrhea may be thus explained and a rational course of general treatment is suggested.

Treatment.—The habits of the individual should be investigated in reference to her mode of living and possible dissipations. If she has recently changed her residence to another climate or to some foreign country, the assumption is not out of place that in due time the menstrual periods will be reëstablished. If she is addicted to the morphine habit, its correction may bring relief. If she has suffered from some mental shock or anxiety or from some nervous disorder, the treatment is best directed toward the relief of these conditions.

There is a so-called functional amenorrhea in which the genital organs are apparently healthy and the general state of health is good. Such cases call for no active treatment, either local or general. The thought of these patients should be directed away from their sexual disorders, daily exercise in the open air should be insisted upon, and the excretions and diet properly regulated. Local treatments are meddlesome and cannot be productive of good.

The chlorosis of young women, which is commonly associated with amenorrhea, is best treated by a judicious regulation of exercise in the open air, by prescribing a liberal diet, and by the administration of iron and arsenic. Too constant application to study should be discouraged; shorter hours in school and longer hours of rest and exercise in the open air are imperative. In severe cases it may be necessary to take the girl out of school for a time. Blaud's pill in 1- to 2-grain doses, together with 3 to 7 drops of Fowler's solution given after each meal and at bedtime and continued several months, will often effect relief. When iron is not well borne by the mouth it may be given hypodermically in the form of ammonio-citrate of iron, $\frac{1}{2}$ grain dissolved in $\frac{1}{2}$ dram of sterile water. Laxatives are essential in regulating the bowels.

1 to 5 grains of reduced iron in pill form is a favorite method of administering iron in chlorosis.

Acting on the theory that chlorosis is due to the lack of internal secretion of the ovary it would be logical to administer corpus luteum extract (Parke, Davis & Co.), given in capsules of 5 grains each after meals and at bedtime. Bandler recommends ovariin for the same purpose.

Emmenagogues designed to stimulate the menstrual flow cannot be depended upon and are not recommended.

There is no surgery for amenorrhea unless the obstruction to the outflow of the menstrual blood is regarded as an example of amenorrhea.

The following prescriptions are recommended by the author:

℞—Magnesii dioxid. . . . . ʒj 4|
Aloin. . . . . gr. iij |194
Fiat. pil. no. xxx.
Sig.—One pill three times daily.

℞—Strychninæ nitratis . . . . . gr. iij |194
Apioline . . . . . ʒj 4|
Fiat. caps. no. xxiv.
Sig.—One capsule after meals.

Pain in the Pelvis during Menstruation (Dysmenorrhea).—Pain in the pelvis is often referred to the uterus or ovaries. Of all pains in the abdomen the so-called "ovarian pain" is by far the most usual. Experience has taught that pain is referred to the ovary of the left side three times as frequently as to the right. There is no satisfactory explanation for this. It is a matter of every-day clinical experience that the pain is often referred to the left ovary when there is no apparent disease in either ovary; more than that, there may be no demonstrable lesion in the pelvis. Even more strange is the finding of the lesion in the right ovary and the pain referred to the left ovary. The author makes no attempt to explain these facts. Certain it is that reflex pains may be located in the ovary and the lesion confined to the uterus or opposite ovary. It must not be inferred from complaints of pain in the ovary that its structure is diseased, but such pains may well suggest possible lesions in one or more of the pelvic viscera. Such pains are particularly frequent and severe at the time of the menstrual period. This leads to the discussion of dysmenorrhea, a term often misused and little understood.

Ernest Herman estimates that only 40 per cent. of women menstruate without pain, and that 10 to 20 per cent. of unmarried women are bedridden with pain during a part or all of the menstrual period.

Primary Dysmenorrhea.—In determining the cause of dysmenorrhea the condition of the nervous system must first be considered. A condition causing pain in one individual may be unnoticed in another of more stable equilibrium. When pain in the pelvis is complained of during and between the menstrual periods and a thorough examination reveals nothing abnormal in the pelvis, it is a common habit to conclude that the fault lies in a functional derangement of the nervous system, and such vague terms as hysteria, neurasthenia, and neuroses are applied. A certain degree of pain during the menstrual period may

be considered within normal limits, and in very nervous women such pains may become exaggerated to actual suffering.

The author's opinion is that severe dysmenorrhea in the absence of pelvic abnormalities is rare. The individual becomes more and more nervous as the result of her periodic suffering. The author, therefore, is inclined to regard the general nervousness as an effect rather than a cause of the menstrual pain. The local disorder may be nothing more than a tetanic contraction of the sphincter uteri, which does not occur in the intermenstrual period. Such cases respond to dilatation of the cervix. They are also the cases which are relieved by childbearing.

The explanation of the "normal" menstrual pain is probably found in the engorgement of the endometrium, which, acting as a foreign body, excites the uterus to contract; and it is these uterine contractions which occasion the pain. In many of the pathological lesions involving the pelvic viscera, the menstrual congestion is added to the already engorged tissues, and the pain is severe. It is exceptional for pathological lesions to exist in the uterus and adnexa without dysmenorrhea, but knowing such to be possible, and, on the other hand, knowing that pain of equal intensity may exist in the absence of a pathological lesion, it is difficult to determine how much of the pain is due to structural changes and how much to an excitable nervous system. Thus dysmenorrhea is spoken of as being idiopathic or primary when it is evident that the pain bears no relation to pathological lesions of the genitalia, and secondary when it is evident that the pain is the direct result of a morbid condition in the genital tract.

Schultze suggested an explanation for dysmenorrhea occurring in young girls and young women in whom nothing abnormal was discovered to account for the pain. He suggests the possibility of hypoplasia of the uterine musculature being present, and hence the uterus is unable to expel the menstrual blood as fast as it accumulates in the uterus. In this condition two sorts of pain may arise, premenstrual and menstrual, the former being due to tension in the congested uterus. In these cases pregnancy often results in a cure because of the development of the uterine musculature.

Secondary Dysmenorrhea.—Secondary dysmenorrhea may be caused by all lesions of the genital tract. These may be classified under:

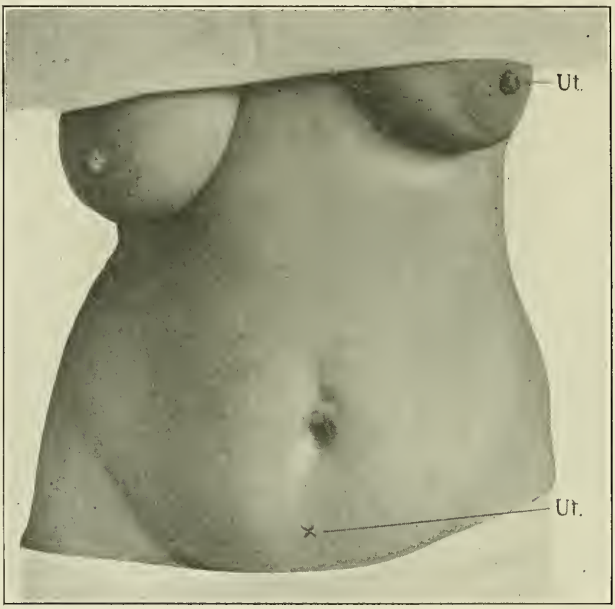
Maldevelopments and Malformations.—Maldevelopments and malformations, which cause menstrual pain by obstructing the outflow of the menstrual blood. In this category may be included absence or atresia of the vulva, vagina, and cervix. The menstrual molimina are experienced, but without a show of blood. With the return of each monthly period the pain increases in intensity as the result of accumulated blood within the vagina, uterus, tubes, and, possibly, the pelvis. The obstruction may not be complete, and the retarded blood, having time to coagulate, is then expelled with cramp-like pains—the so-called "obstructive dysmenorrhea."

Superinvolution of the uterus is associated with painful menstruation, the cause of which is not understood. A congenitally small uterus

(infantile) is likewise associated with dysmenorrhea. In either case the explanation possibly lies in the encroachment of the tissue fibers upon the nerve filaments of the uterus.

Malpositions.—Malpositions of the uterus and adnexa are less frequently the cause of dysmenorrhea than are the associated lesions. It is exceptional for the menstrual blood to be obstructed in its outflow by the bending or twisting of the long axis of the uterus. Pain is more often the result of complicating lesions in and about the uterus and its appendages.

Fig. 1



Showing uterine pain referred to the suprapubic region and to the breast.

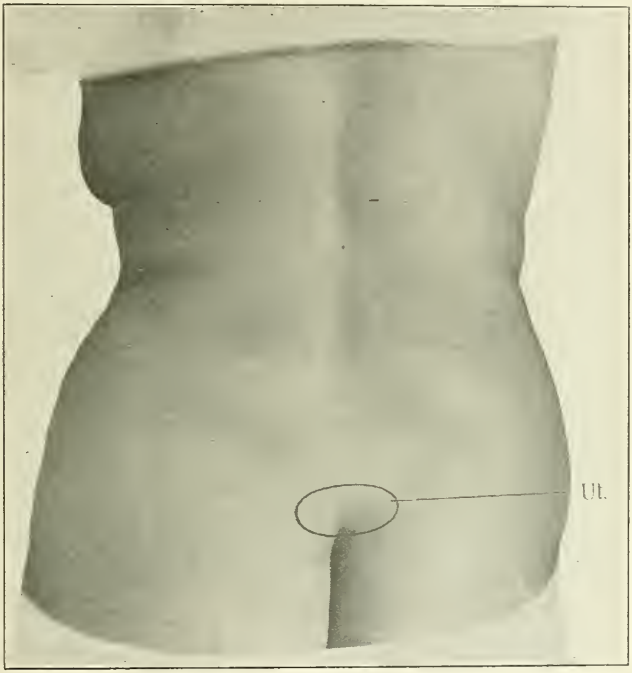
Anteflexion of the uterus, when extreme, is almost always associated with pain. The cause of the pain in these cases is still a matter of controversy. It is not probable that the canal is obstructed by the bending of the uterus, as was formerly believed. Hyperesthesia, resulting in muscular spasms of the internal os, is a more satisfactory explanation for the obstruction. It is evident that the pain in such cases is largely neurotic in origin.

Anteflexion of the uterus is said to be a frequent cause of dysmenorrhea in virgins and nulliparous married women. In these cases it is often observed that a small sound will pass the internal os, yet there is evident mechanical obstruction to the outflow of the menstrual blood. The explanation lies in the swelling of the mucous membrane during the menstrual period, together with spasm of the sphincter above referred to. The passing sound compresses the swollen mucosa.

Inflammatory Diseases.—In inflammatory diseases of the uterus and adnexæ, which are more or less tender and painful in the intermenstrual period, the suffering is greatly intensified by the menstrual flux—"congestive dysmenorrhea." Plugs of tenacious mucus may fill the cervical canal and obstruct the menstrual flow.

New-formations.—New-formations, notably fibroid tumors in the genital tract, may obstruct the menstrual blood—"obstructive dysmenorrhea." Pelvic tumors share in the menstrual congestion, and by their enlargement the pressure symptoms are intensified.

FIG. 2



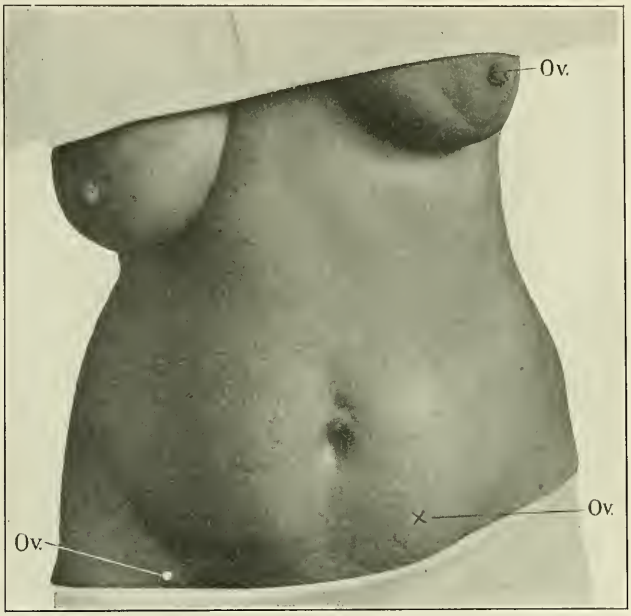
Location of pain referred to the uterus.

Membranous Dysmenorrhea.—Membranous dysmenorrhea is a term first applied by Morgagni. In this condition there is a discharge at the menstrual period of a part or of the whole of a cast of the uterine cavity. The discharge of the membrane may occur but once or at successive menstrual periods. If it were believed that the endometrium is shed at each menstrual period, the conclusion might readily be accepted that membranous dysmenorrhea is merely an exaggeration of the normal process. The membrane may be shed as a complete triangular cast of the uterus, or may be discharged in shreds.

Membranes are more frequently passed in the menstrual flow than is known. Without a systematic examination of the clots expelled,

such membranes will often escape notice. Sir I. Williams found membranes in three-fourths of his cases of dysmenorrhea and Scanzoni in two-thirds. They may be passed without pain. The possibility of monthly abortions must be borne in mind. Virgins and sterile women are most affected, though the disease is not unknown to women who have borne children. The diagnosis depends upon a careful examination of the expelled membrane. (See Chapter VIII.)

Fig. 3



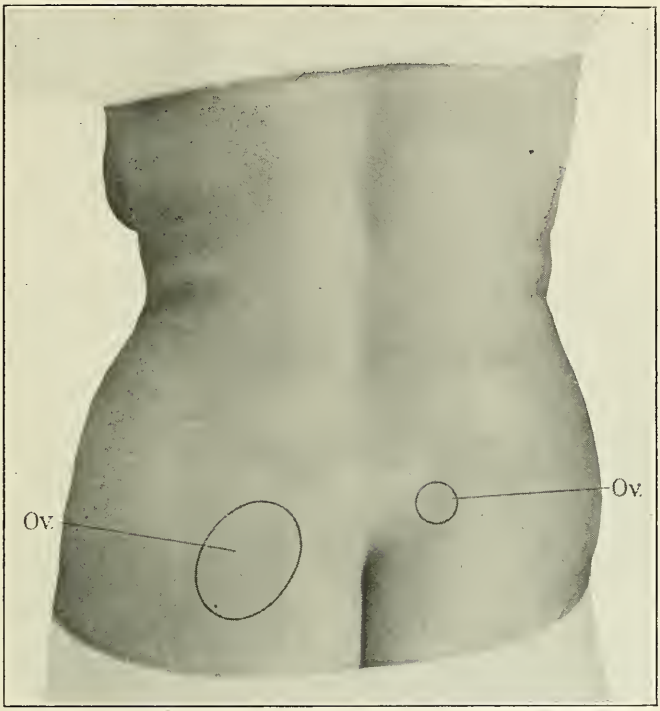
Showing location of ovarian pain referred to the breast, to the iliac region, and to the inner aspect of the thigh.

Under the microscope a great variation in structure is seen. The membrane may resemble an hypertrophied endometrium, a decidua, or a fibrinous membrane. Accompanying the discharge of the membrane is intense pain. The membrane is not to be mistaken for the decidua of extra-uterine or intra-uterine pregnancy.

Nasal Dysmenorrhea.—Fliess, in 1897, demonstrated a definite relationship between the mucous membrane of the nose and the genitalia in women. He observed certain swollen and tender red spots ("genital spots") on the nasal septum and inferior turbinates. Schiff made a number of clinical observations and conclusively demonstrated that temporary relief is often afforded by cocainizing these genital spots, and that permanent relief can be afforded by the use of the cautery. Ephraim treated twenty-four cases with eight good results. These reflexes, together with the established fact of vicarious menstruation

from the nose, would appear to establish beyond a doubt an intimate relationship between the nasal and genital passages. In these cases great caution was exercised in excluding the influence of mental suggestion. The author is inclined to believe that the procedure is irrational and will not stand the test of time.

FIG. 4



Location of pain referred to the tubes and ovaries.

Periodic Intermenstrual Pain (Mittelschmertz).—By the term intermenstrual pain, a condition is understood in which pain of a definite character recurs at monthly intervals between the regular menstrual periods. Very often the time is midway between menstrual periods, but may be earlier or later.

Time of Occurrence.—These intermenstrual pains may begin with the establishment of the menstrual cycle, but in the majority of cases they first appear some years after puberty. They may persist throughout the entire menstrual life or may recur at regular intervals over a much shorter period.

Childbearing in relation to intermenstrual pain is of significant interest. In an excellent article Heaney[1] analyzed the reports of 66

[1] Surg., Gyn., and Obst., October, 1910.

cases, showing that the affection occurs with greatest frequency at the period of sexual maturity. There was a high percentage of sterility; only 3 of the 66 became pregnant after the onset of intermenstrual pain and but one of these carried the child to term. In the majority of cases the intermenstrual pain began one or more years after puberty.

Heaney says, "Pain is the fixed symptom and is very characteristic." The pain appears in the intermenstrual period with the same regularity as the menstrual periods. These pains are colicky in type and are more common on the left side of the pelvis. In more severe cases the pain is referred to the entire pelvic region and may radiate to one or both thighs.

Leucorrhea.—While there is an accompanying vaginal discharge in many of these cases, it is not possible to establish any direct or indirect relationship between the vaginal discharge and the pain.

Dysmenorrhea.—There is no direct relationship established between intermenstrual and menstrual pains. In about half the cases there are no menstrual pains.

Associated Pathological Lesions.—In a small proportion of cases the pelvic organs appear perfectly normal, while in many cases the lesions found cannot be held responsible for the pain. There is a preponderance of uterine fibroids in these cases. The belief is frequently expressed that the tube is the seat of the pain. Giles and Bland Sutton believed the symptom complex to be due to intermittent hydrosalpinx, the pain being due to the effort of the tube in expelling the contained fluid. Observations after operation do not support this theory. Heaney believes that "Mittelschmertz" is an abortive attempt at menstruation, having as its foundation sclerosed ovaries and uterus.

Treatment.—The disease, if it may be called a disease, is not self-limited. Numerous methods of treatment, both general and local, have been suggested, and with indifferent results. Ovarian extract, thyroid extract, electricity, stem pessary, dilatation and curettage, removal of one or both appendages, all these have been tried with but an occasional good result.

All that can be said is that the general condition of the patient should be improved by hygienic measures, notably rest, outdoor exercise, nourishing diet and baths, and finally, that lesions within the pelvis which may possibly account for pain should be removed. The most plausible explanation for the pain is that of Priestly, who believes the pain to be dependent upon ovulation. It is known that ovulation occurs in the intermenstrual period, and usually midway between periods, hence the suggestion that nothing short of removal of the ovary will effect a cure with any degree of certainty. Resort to this procedure should be taken with great deliberation, if indeed it should be countenanced.

Treatment of Dysmenorrhea.—Of all the symptoms complained of by women, pain is the least trustworthy, inasmuch as pain may be present without any demonstrable lesion, and, on the other hand, pain may be

absent in the presence of any of the pelvic lesions. The psychic element plays a most important role, and must always be reckoned with in estimating the significance of pain.

Medical Treatment.—A very large proportion of women suffering from dysmenorrhea are psychoneurotics, hence the great value of psychic and hygienic treatment. In the absence of demonstrable pelvic lesions the management of this class of cases is in general as follows:

Open-air exercise regulated in accordance with the patient's strength and the placing of the patient under conditions that will most agreeably absorb her attention and take her mind from her fancied ailments; the stimulating cold plunge or shower in the morning and the sedative hot bath in the evening, and finally the enjoining of rest in bed for two or three days at the onset of menstruation; all these provisions will tend to lead her out of her troubles and effect a cure.

It is most important to look to the general nutrition. Many of these patients are underfed, and it will be found that they become more tolerant to suffering and indeed suffer less, as they become better nourished. They should be instructed to take a liberal mixed diet at the regular meal hours and between meals, and at bedtime should be given a glass of milk, malted milk, cocoa, or eggnog.

Rest should be enjoined to suit the individual case. Not less than eight hours of sleep should be required of all, and in many instances a midday nap of one or two hours should be added. A girl suffering from severe menstrual pains should be kept quietly at home while menstruating. While suffering severe pain she should be kept in bed. As the general health improves the pain will usually lessen and more liberties may be granted.

Outdoor exercise should be indulged in and encouraged for the purpose of improving the general resistance. No restrictions should be placed upon the desire for any healthful exercise. In the intervals between menstrual periods several hours a day should be devoted to such exercises.

Regulation of the bowels, particularly just preceding and during the menstrual flow, is an important factor in relieving painful menstruation. The giving of saline cathartics at such times will do much in relieving pain.

A hot hip bath or full tub bath, at a temperature of 110° F., taken for a half-hour at the beginning of the premenstrual symptoms, will do much to prevent the onset of pain and to promote a free menstrual flow. Great care should be exercised in preventing a chill of the body upon leaving the bath. The room should be warm, and after leaving the bath, the body should be hurriedly dried with a soft towel and wrapped in a warm, blanket and finally there should be an hour or more of rest in bed following the bath.

The hot-water bag placed over the hypogastrium is usually sufficient in itself to control pain, and is a most acceptable substitute for drugs. The hot vaginal douche and hot saline rectal injections are helpful

adjuncts to the hot bath. A hot mustard foot bath is a domestic remedy of some value; two teaspoonfuls of mustard are placed in a pail of hot water.

Opiates and alcoholics are seldom necessary and are capable of much harm. Many women have become addicted to opium and to alcohol by their injudicious use in controlling pain at the menstrual periods. Many of the patent remedies advertised for the cure of menstrual disorders contain a large percentage of alcohol. The Massachusetts State Board estimated the percentage of alcohol in Lydia Pinkham's Vegetable Compound as 20.6; in Peruna, 28.5; Pain's Celery Compound, 21; Ayer's Sarsaparilla, 26.2. When, in the judgment of the physician, alcohol or opium is required the precaution should be taken to prescribe them in such a manner as to make it impossible to have the prescription refilled or for the patient to know what she is taking. The following are favorite prescriptions for the relief of menstrual pain:

℞—Aspirin . . . . . ℥j 4|
Veronal . . . . . ℥j 4| —M.
Ft. caps. no. xii.
Sig.—One every four hours.

℞—Phenacetin . . . . . gr. ij |03
Salol . . . . . gr. ij |03 —M.
Ft. charta. Mitte tales no. vi.
Sig.—One powder every four hours.

℞—Phenacetin . . . . . gr. v 0|325
Codein. . . . . gr. v 0|325—M.
Ft. charta. Mitte tales no. vi.
Sig.—One powder and repeat in an hour.

℞—Aspirin . . . . . gr. iij 0|195
Phenacetin . . . . . gr. iij 0|195—M.
Ft. tal. caps. no. xx.
Sig.—One every three hours.

℞—Apiol . . . . . gr. j 0|065—M.
Ft. caps. no. xii.
Sig.—One night and morning for three days before menstruation.

℞—Acetanilid . . . . . gr. ij 0|13
Heroinæ . . . . . gr. $\frac{1}{6}$ 0|01 —M.
Ft. cap. no. vi.
Sig.—One every two hours for three doses.

℞—Sodii bromid . . . . . gr. xl 2|6
Hot salin sol. (physiological) . . . . Oj | —M.
Sig.—Inject into rectum and retain. (Kelly.)

℞—Tr. opii camphorata . . . . . ℥j 4|c.c.
Spt. chloroformi . . . . . ℥ij 8|c.c.
Aq. menth. pip. . . . . q. s. ad ℥iv 120|c.c.
Sig.—One teaspoonful as required.

℞—Acetanilid . . . . . gr. ij |130 gm.
Ammon. carb. . . . . gr. iij |194 gm.—M.
Ft. pil. no. vi.
Sig.—One pill every hour for three doses.

℞—Ergotin . . . . . gr. xxx 1|94 c.c.
Stypticin . . . . . gr. xxx 1|94 c.c.
Div. in caps. no. xx.
Sig.—One capsule every six hours during menstruation.

℞—Strontii bromid. . . . . ℥iv 15|52 c.c.
Syrup acaciæ . . . . . ℥iij 90| c.c.
Sig.—Teaspoonful in water every three hours.

When pain is associated with the expulsion of blood-clots, Bandler recommends stypticin in 2-grain doses repeated several times daily. When the uterus is relaxed, as in muscular insufficiency, ergot may be given in small and repeated doses.

When pain is of a congestive character the pelvis is depleted by such means as sitz baths, hot hip packs, hot vaginal douches, saline catharsis, and the application of a hot mustard plaster to the spine. A plaster three inches in width is placed on the spine from the neck to the sacrum. The following method is used in preparing the plaster: mustard is rubbed into a thick paste by adding warm water and reduced to a thick consistency by adding molasses or syrup. A piece of unstarched muslin about 24 inches long and 9 to 10 inches wide is spread through the middle third and the lateral thirds of the muslin are folded over the mustard paste. After warming the plaster it is applied the length of the spine for ten to twenty minutes and then removed. Emmet believes that dry cups are more efficacious than the mustard plaster. Four to six large tumblers may be used. They are to be placed over all tender points along the spine and left in place for fifteen minutes.

Surgical Treatment.—When tentative measures fail to afford relief the final resort must be to surgical intervention. A very large proportion of cases are due to pelvic lesions which are only amenable to surgery. In order that tentative measures on the one hand and surgical measures on the other may be wisely ordered, there must be a thorough appreciation of the social, moral, and physical conditions affecting the individual. Without this understanding there can be no intelligent management of this class of cases.

Dilatation of the Cervix.—The one operation that has been generally approved in the management of dysmenorrhea is dilatation of the cervix. Even when there is no known anatomical basis for the pain, the overstretching of the cervix will often effect a cure. Kelly dilated 95 such cases and obtained permanent relief in 18 and great benefit in 14; 7 more were partially or completely relieved for from one to twelve years when the pain returned. It is not clear just how these results are brought about. The probable explanation is in the overstretching of the cervix, which overcomes the spastic contractions which cause a temporary obstruction to the menstrual flow. By reference to the many factors contributing to pain at the menstrual period it is apparent that dilatation of the cervix is limited in its applicability. No good can come from dilatation in many of the displacements, inflammations, degenerations, and new-formations of the pelvic organs. The technic of dilatation and curettage is described in Chapter VII.

It would be well to discuss dilatation and curettage in the treatment of dysmenorrhea because this procedure is so frequently resorted to. Failure to effect relief is not so much ascribed to faulty technic as to a faulty diagnosis. The existence of a retrodisplacement or prolapsus of the uterus, of a subinvolution or chronic metritis, of an inflammatory

Fig. 5

Conical cervix, punctiform orifice. (Pozzi.)

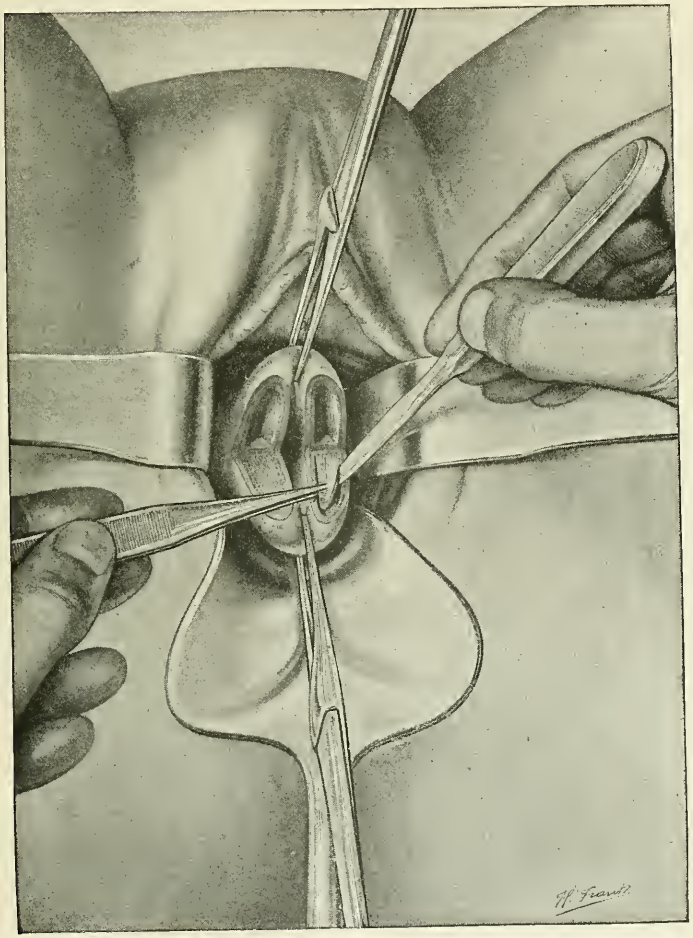
involvement of the adnexæ or of fibroid tumors, pelvic exudates or cystic ovaries, not recognized or not given due consideration, renders dilatation and curettage ineffective and often harmful.

The uterus should be dilated and curetted in the presence of an existing endometritis, or of a marked anteflexion and as a sole measure

it should be employed only in the absence of other pathological lesions. When relief is afforded for a number of months or years, and pain again returns, a second dilatation and curettage will be indicated.

Primary dysmenorrhea is relieved in many instances by dilatation of the cervix and curettage. In the absence of a pathological lesion

Fig. 6



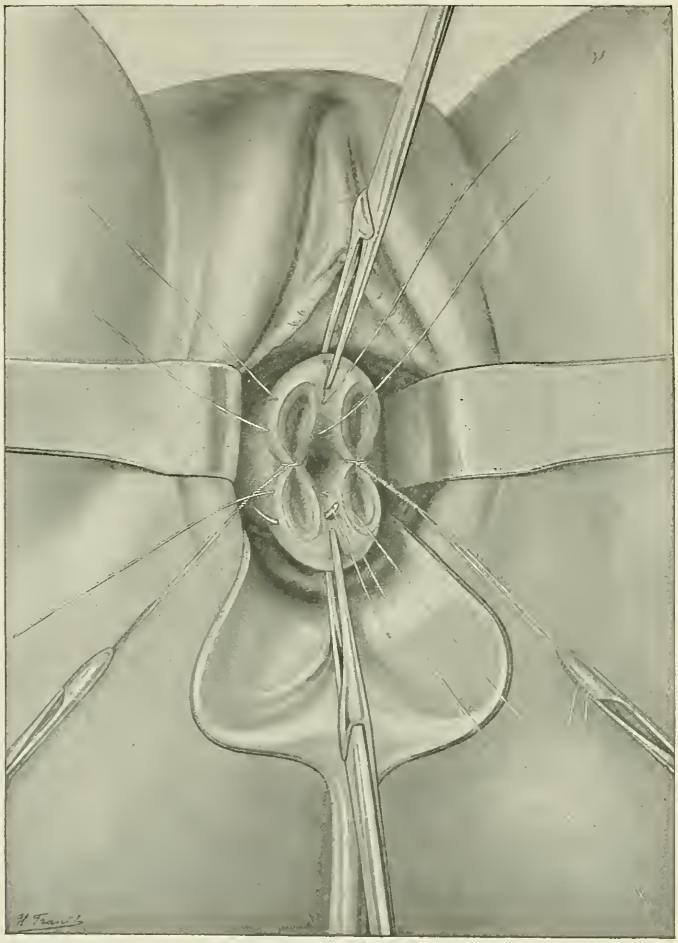
Hollowing out of the cut surfaces of the cervix. (Pozzi.)

the results gained must be due to suggestion. The presence of anemia, malnutrition, and neurasthenia does not necessarily mitigate against the good results to be obtained from this procedure. Inasmuch as it is not possible to foretell which cases will be benefited and which will not, it would seem wise to subject all cases to dilatation and curettage which cannot be controlled by more tentative measures.

Membranous dysmenorrhea presents a very discouraging prognosis. Curettage and the application of various chemicals have been tried with little result.

Stem Pessary.—The stem pessary has been recommended for the cure of dysmenorrhea associated with anteflexion of the uterus; but the

FIG. 7



Introduction of the stitches. The commissural stitches are drawn tight. (Pozzi.)

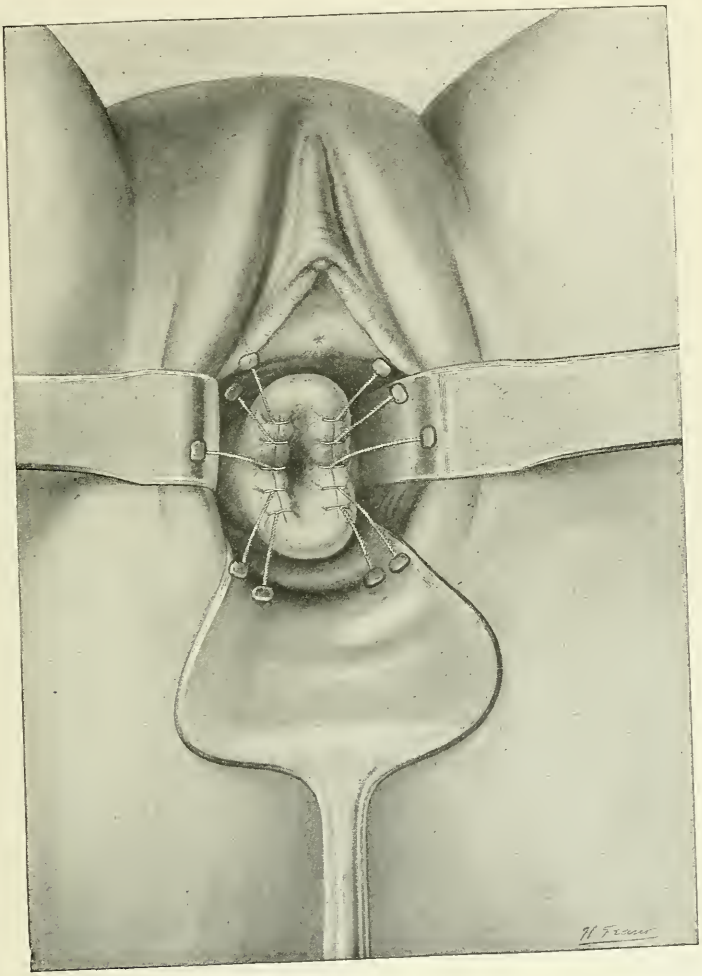
author has no personal experience with this contrivance and does not look upon it with favor.

Removal of the Ovaries.—Should apparently healthy ovaries be removed for relief from dysmenorrhea? The author has never met with a case that seemed to him to justify such a procedure, and he

very much questions if the operation is ever justified under such conditions.

He would here quote Kelly and add his personal indorsement: "Oöphorectomy, which is still, I fear, too often done for intractable dysmenorrhea, is rarely, if ever justifiable. Let the younger surgeon

FIG. 8



The operation finished. All stitches have been drawn tight and the leaden guards applied. (Pozzi.)

be assured that he may thus transform a neurotic invalid into a gloomy wreck, fitted only for an asylum, when she will be a reproach to his art to her dying day. Nothing is sadder than that he who comes to heal should injure, and that he should be responsible for the fact, that

the after-state of the patient is worse than the first. It is better that ten women should continue to endure periodical suffering for which he is not responsible, than that he should cure nine and put one in an asylum."

Dysmenorrhea Due to a Conical Cervix.—A very common cause of sterility and dysmenorrhea is said to be found in a conical cervix in which the external os is very small. This condition is an arrest of development and is commonly associated with an arrest of development of the body of the uterus (infantile uterus). The cervix is relatively long and is flexed forward, thereby affording additional cause for dysmenorrhea and sterility.

Figs. 5, 6, 7, and 8, from an article by Pozzi,[1] present the technic of the operation of Pozzi for the correction of this condition. The operation should be preceded by dilatation and curettage. Pozzi claims for this operation that he has invariably relieved dysmenorrhea and that pregnancy has followed in more than 25 per cent. of his cases.

BACKACHE

Causes
Treatment
Coccygodynia

Pain in the back is so frequent a complaint of women as to demand special consideration. Backache is not common in the young or in the aged, but occurs with great frequency between the ages of thirty and fifty.

Causes.—It is a matter of common observation that the correction of pelvic disorders, notably of retrodisplacements of the uterus, does not always relieve backache. This suggests two things: (1) That uterine displacements do not, as a rule, cause backache, contrary to popular opinion, and (2) that the causes of backache are varied and oftentimes obscure. Following are the usual causes:

Lumbago.—Lumbago is the result of exposure and muscular strain. The onset is usually sudden and the pain and discomfort are most distressing. The treatment consists of heat applied to the lumbar region in the form of hot-water bags, ironing the muscles with a hot iron for several minutes, massage of the lumbar muscles, rest in bed, and the administration of 10 to 20 grains of aspirin, every two to four hours, until the pain is under control, and thereafter 5 grains every two to four hours.

Nervous Exhaustion.—Nervous exhaustion is almost invariably associated with backache. The pain is usually referred to the lumbar region.

Pelvic Tumors and Inflammatory Exudates.—These cause backache which may radiate to one or both thighs. Pain in the back which radiates to the thigh, suggests the probable presence of an incarcerated

[1] Surg., Gyn., and Obst., August, 1909.

or adherent tumor or inflammatory mass in the pelvis encroaching upon the sacral nerves.

Prolapse of the Ovary.—When the ovary lies behind the uterus pain is commonly referred to the sacro-iliac joint of the respective side. The author has demonstrated this repeatedly by correcting the position of the ovary.

Retroflexion of the Uterus.—Retroflexion of the uterus is a cause of backache, but not to the extent generally believed.

Postoperative Backache.—Postoperative backache is a preventable complaint. It is due to strain upon the interspinous ligaments as the patient lies upon a hard operating table without pad or cushion to support the back. Furthermore, the ligaments of the sacro-iliac joints are also unduly strained by forcible abduction of the thighs with the legs in supports and the patient in the dorsal position for vaginal operations.

Mobility of the Sacro-iliac Joint.—Many of the backaches are attributable to luxation of the sacro-iliac joint.

Static Backache.— It is now generally recognized that relaxation of the sacro-iliac joint gives rise to backache that was formerly ascribed to uterine displacements and other pelvic lesions. Albree has demonstrated the sacro-iliac joint to be a true joint which normally permits of a limited degree of motion. If, for one reason or another, the ligaments of the joint become relaxed there will be an undue mobility of the joint with consequent pain.

Reynolds and Lovett[1] ascribe certain forms of chronic backache to strain upon the muscle of the back, caused by an undue effort to maintain the body balance. They endeavor to show that the centre of gravity of the body, in the erect posture, lies in front of the ankle-joints, knees, sacro-iliac joints, and most of the vertebral joints. The factors operating in the maintenance of the erect posture are chiefly the hamstrings, the glutei, and the erector spinæ muscles. If for any reason the centre of gravity moves forward a strain is placed upon the posterior musculature. Authors have investigated the influence of corsets and high-heeled shoes upon the balance of the body. A properly fitting corset should fit tightly between the trochanters and iliac crests, it should fit the hollow of the waist snugly, and above the waist it should be worn loosely. The front should be straight and without constriction at the waist line. No corset should be worn that is not comfortable; after putting on the corset as low as possible and before it is laced, the wearer should pass the hand inside and lift the abdomen, and at the same time tighten the laces from below upward.

High-heeled shoes tip the body backward, and hence add to the comfort of a well-fitting corset and lessen the discomfort of a poorly fitting corset. This is so because the muscles of the back are relieved of the strain caused by the corset throwing the centre of gravity backward.

Causes.—Meisenbach classifies the causes of relaxation of the sacro-iliac joint in women as follows:

[1] Jour. Amer. Med. Assoc., March 26, 1912.

Traumatisms.—A blow or a fall, relaxation and strain from faulty position under anesthesia; long and rough riding on horseback or in automobiles are the traumatic factors mentioned.

General Debility.—General debility, following wasting diseases and acute illness, such as typhoid fever; under such circumstances both joints are usually involved.

Uterine Disorders.—Uterine disorders associated with pelvic congestion. The condition commonly follows pregnancy, particularly a difficult labor in which high forceps are used.

Neuroses.—Backache occurs in women of highly excitable temperament. It is said that the periods of intermittent relaxation appear at times to cause a strain of the joint. To the author this explanation seems vague.

Diagnosis.—The *x*-rays are of little service in making a diagnosis of luxation of the sacro-iliac joint, but the stereoscopic radiograph is of great value. The treatment consists in the application of a plaster or celluloid jacket of steel braces, elastic webbing, etc. Such cases should be referred to the orthopedist.

Gonorrheal Arthritis.—Gonorrheal arthritis affecting the sacral joints is an occasional cause of backache.

Faulty Dress.—Faulty dress is responsible to a great degree for backaches complained of by women. This subject is discussed in Chapter XII.

Gastro-enteroptosis.—Gastro-enteroptosis, with general relaxation of the pelvic supports, produces a feeling of heaviness in the pelvis and a weak back.

Treatment.—In the management of these cases it is important to recognize the nervous element and the lack of general nutrition on the part of women complaining of backache. Without an improvement in the general state of health little good can come from correcting the local conditions. This is accomplished by giving a suitable mixed diet, by directing a systematic course of exercise within doors and outdoors, by stimulating morning baths, and by skilful massage of the muscles of the back.

General tonics, notably nux vomica in 5-drop doses, increased 3 drops a day until 25 drops are taken before each meal, is recommended by Kelly. Static electricity is beneficial.

The correction of pelvic lesions which contribute to backache calls for depleting treatment in pelvic inflammations, for pessaries in movable displacements of the uterus, and for surgical interference in lesions which are only amenable to surgery. Careful consideration must be given to the manner of dress and the personal habits of the individual.

Coccygodynia.—Coccygodynia is a term applied to pain referred to the coccyx.

Direct injury from a blow, a fall, or from the strain of labor is the usual cause. It is probable that rheumatism, especially of gonorrheal origin, plays an important part in the etiology of this affection.

The disease has been called the "sitting pain," because of the dis-

comfort and sometimes unbearable pain experienced in sitting. Walking and standing do not, as a rule, cause much discomfort. Pressure upon the coccyx by the examining finger either from without or through the rectum will locate the seat of pain. Defecation is often painful, and especially when there is constipation.

Treatment consists in improving the general health through hygienic means, of applying the faradic current, and of massaging the coccyx by gentle manipulations; if these methods fail to give relief, the coccyx must be removed.

In the management of coccygodynia, palliative treatment and even resection are often unsatisfactory. Massage of the coccyx is productive of the best result. The bone is held between the forefinger in the rectum and the thumb on the outside; it is then moved backward and forward and the soft parts are moved about on the bone. Immediate improvement will usually follow.

Fig. 9

Demonstration of the separation of the recti muscles in visceroptosis.

DIASTASIS RECTI: ENTEROPTOSIS

Causes
Symptoms
Treatment

Patients suffering from enteroptosis commonly complain of backache, pain in one or both kidneys, general dragging sensations in the abdomen, dyspeptic symptoms, and general nervousness.

On physical examination the abdominal wall is found to be relaxed, permitting of deep indentation between the widely separated recti muscles. When in the standing position the abdomen is pendulous, and on straining or coughing there is marked protrusion between the recti muscles.

In these cases it is not enough to correct the relaxed and torn supports of the pelvic floor. The profession is indebted to J. Clarence

FIG. 10

Marked separation of the recti muscles. The fist is buried in the gap between the separated muscles.

Webster for calling attention to this important defect. The greatest point of stretching of the fascia is usually at the umbilicus, but may extend the entire length of the central line from the symphysis to the pubis. This stretching of the fascia may separate the recti muscles from two to five inches.

Causes.—Childbearing is the predominating factor. This is particularly true when there is a succession of pregnancies. Heavy lifting increases the defect and malnutrition is an important predisposing factor.

FIG. 11

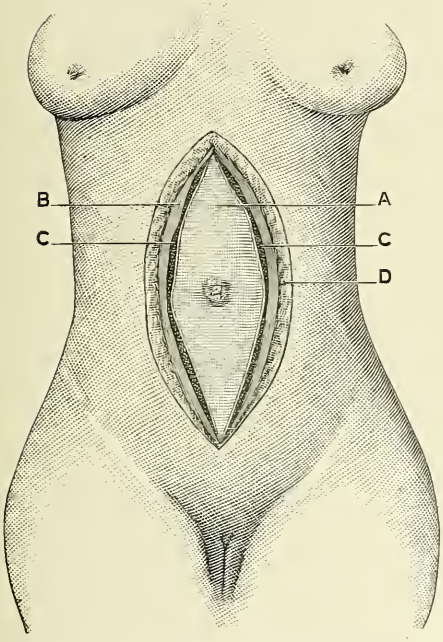
In this scheme the abnormal separation of the recti muscles is shown, which permits a hernia-like projection of the viscera.

Symptoms.—The symptoms commonly complained of are backache, dragging sensations in the abdomen, a sense of weight and insecurity in the pelvis, a feeling of fatigue on moderate exertion, dyspepsia, general nervousness, constipation, and pain in the iliac and lumbar regions. The pulsations of the aorta are often distressing. It is sometimes desirable to place the patient in the standing posture for

the purpose of inspecting the abdomen. In this position a pendulous abdomen is best inspected.

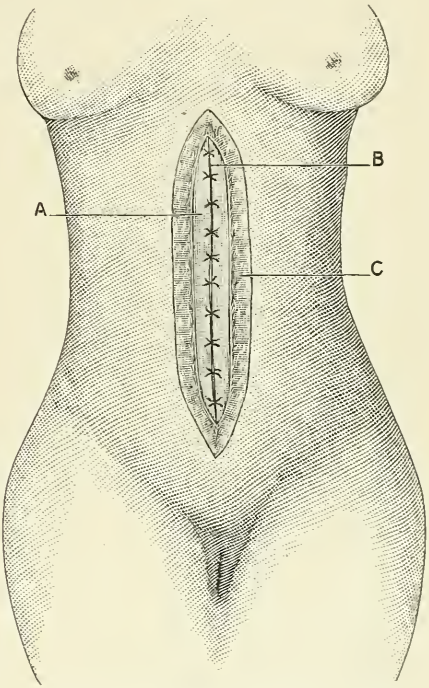
The body is draped with a sheet from the hips down; the remainder of the body is stripped. The flat chest, the depressed epigastrium, the long waist, the drooping shoulders, the general flabby muscular development, and the prominent abdomen are then noted.

Fig. 12



Operation for repair of weakened abdominal wall. The drawing represents the inner edges of the separated recti muscles exposed. *A*, stretched and thinned linea alba; *B*, anterior layer of sheath of rectus; *C*, edge of rectus muscle exposed by opening sheath; *D*, skin and subcutaneous tissue. (Webster.)

Fig. 13



The drawing represents the recti muscles with the fascia covering them drawn together and sutured by strong linen. *A*, fascia forming anterior sheath layers of rectus; *B*, line of juncture of the muscles and sheaths; *C*, skin and subcutaneous tissue. (Webster.)

Treatment.—When the diastasis is of moderate degree the conditions may be remedied by discarding a faulty corset, by suspending the clothing from the bust and shoulders, by systematic exercises, and the proper regulation of the diet. Abdominal supports may bring relief, but, as Webster says, they are objectionable because they produce atrophy and weakening of the trunk muscles, and they are uncomfortable to wear in hot weather.

Technic of Operation.—Webster makes a median abdominal incision corresponding in length to the line of separation. The umbilicus may

or may not be excised. The skin and subcutaneous fat are dissected from the underlying fascia to the margins of the separated recti. The fascia is then split from below upward at the attachment to the recti muscles; the muscles are dissected from the underlying fascia and are then approximated in the median line by interrupted linen sutures. Catgut may be used to complete the approximation. When there is an undue amount of redundant skin, this may be removed in a strip from either side and the margins sutured in the usual manner.

CHAPTER III

LEUCORRHEA—STERILITY—THE MENOPAUSE

LEUCORRHEA

Normal Secretions of the Genital Organs
Clinical Grouping According to Age
In Infants
In Virgins
In Period of Sexual Maturity
In Old Women
Diagnosis
Odor
Treatment

Any discharge from the vulva that is not blood is popularly called "whites" or leucorrhea. When the secretion departs from the normal in color, consistency, odor, irritability, and amount, there must exist either a functional or an organic lesion of the genital organs. Hence it is of the greatest importance to determine the character and source of the secretion.

The Normal Secretions of the Genital Organs.—These are: 1. From the vulva the ordinary secretions are those of the sebaceous and sweat glands. The Bartholinean glands lying in the labia majora secrete mucus, particularly during sexual excitement. The reaction is alkaline, and the amount is scarcely noticeable.

2. The vagina does not ordinarily contain glands, but occasionally a few are found in the vault of the vagina. The vagina has essentially a skin surface, having no secretion under normal conditions. The so-called vaginal secretion is the accumulated outpour of the uterine body and cervix mixed with epithelium and bacteria. The secretion is acid in reaction as the result of the action of certain bacteria which change the alkaline secretion of the uterus to an acid reaction.

3. The secretion of the cervix is mucus. It is tenaceous and slightly alkaline in reaction.

4. The secretion of the endometrium is serous and sufficient in amount to moisten the surface; it is mildly alkaline, clear, and transparent.

Clinical Grouping According to Age.—For clinical purposes leucorrhea will be considered as it occurs in the various periods of life.

In Infants.—In children a leucorrheal discharge seldom arises from a point above the hymen. As a rule it is the expression of a vulvitis, which in turn is caused by soiled diapers, intestinal worms, highly acid urine, gonorrhea, masturbation, and the strumous diatheses. The vulva appears swollen and reddened, is tender, and is covered by a slimy secretion.

In Virgins.—In young girls it is not unusual for a transient leucorrhea to appear from time to time. No pathological basis for the leucorrhea can be discovered further than a possible pelvic congestion. Persistent leucorrhea may be due to the same causes found in childhood. As in infants, the contributing lesion is commonly a vulvitis, and is rarely found above the hymen. The secretion is seldom sufficient to more than moisten the vulva, and rarely calls for a local examination. Anemia is always to be considered in determining the contributing factors.

In the Period of Sexual Maturity.—The secretion may come from any portion of the genital tract—from the vulva, vagina, cervix, body, and tubes. In the vast majority of cases the cause may be ascribed to gonorrhea and to labor and abortion. The most profuse leucorrhea is occasioned by gonorrheal infection. Among other causes may be mentioned instrumental and digital inspection, displacements of the uterus, passive congestion due to an interference with the return supply of blood as a result of diseases of the heart, lungs, liver, kidney, and spleen. Abdominal tumors, acute infectious diseases, and all benign and malignant new-formations of the vulva, vagina, and uterus are contributing factors to leucorrhea at this time of life.

Not only the cause but the source of the secretion must be determined. Schultze devised the following method of demonstrating the source of the secretion: Following a vaginal douche of sterile water a large tampon of sterile absorbent cotton is placed against the cervix and left there for several hours. If the secretion comes from the uterus, it will collect upon the top of the tampon and can be examined for bacteria and other elements. If the secretion is mucus and in small amount, it must come from the cervix; if watery and abundant, it comes from the body of the uterus, rarely from the tubes—"hydrosalpinx profluens."

It is of importance to distinguish between a hypersecretion of the endometrium and a discharge due to some pathological lesion. This is often difficult, and may be impossible. Women will often complain of a leucorrhea immediately before and after the menstrual flow. As a result of the congestion which precedes the monthly flow one or more days and continues a variable time after the cessation of the bloody flow, there is a hypersecretion of the glands sufficient to give rise to a seromucous discharge.

In Old Women.—In the aged, leucorrhea has a more serious significance. The source is the vulva, vagina, and uterus. Senile vaginitis, vulvitis, and endometritis are the most common causes.

In the event of unusual discharges from the genital tract of women advanced in years, whether the discharge be watery, bloody, purulent, or ichorous, there is always a suspicion of malignancy, and this thought is uppermost in the search for the underlying cause. Gonorrhea infecting the aged rarely involves the uterus and tubes. The infection is generally limited to the vagina and urethra. The irritation of a filthy and ill-fitting pessary will occasion a vaginal discharge.

Malignant growths produce at first a watery discharge, which later becomes turbid, bloody, and foul-smelling. Cancer of the body of the uterus is more common after the menopause than is cancer of the cervix; therefore, in seeking the cause of a suspicious discharge occurring after the menopause it may be necessary to explore the uterine cavity with a curet. The discharge of a senile endometritis may simulate that of a malignant growth, and nothing short of an exploratory curettage, with a microscopic examination of the scrapings, will establish the diagnosis.

Odor as an Aid to Diagnosis.—The odor of the vaginal discharge is sometimes an aid to diagnosis. The foul odor of a vaginal discharge suggests a rectovaginal fistula or a complete laceration of the perineum. A urinary odor to the vaginal discharge suggests a vesicovaginal fistula. The odor of a discharge from a cancerous uterus is rather characteristic but cannot be distinguished from that coming from a sloughing fibroid or decomposed placental tissue.

Treatment.—It is manifestly unscientific to direct the treatment solely to the relief of a symptom such as leucorrhea. There is always a pathological basis which should be sought for and if possible removed.

It must be borne in mind that certain general conditions may cause leucorrheal discharges; such for example are diseases of the heart, lungs, kidneys, liver, spleen, constipation, and abdominal swellings, which may create a pelvic congestion and in turn produce a hypersecretion of the uterine glands. Faulty excretions, such as are common to uremia, gout, and rheumatism, are also to be considered. The treatment in all such cases is carried out on the general principles laid down in treatises on internal medicine. In general it may be said that the effort should be made to restore the equilibrium of the general circulation by the removal of the cause of the embarrassment to the circulation, and so to regulate the diet and exercise as to promote assimilation and favor elimination.

In all conditions of pelvic congestion dependent upon general causes, local depleting measures must be instituted in connection with the general treatment. These include hot douches, long continued and repeated two to four times a day, glycerin and ichthyol tampons, and free catharsis.

By referring to the causes of leucorrhea as outlined, it will be apparent that the only permanent way of affording relief from these discharges lies in the removal of the cause. As temporary and palliative measures certain well-tried procedures may be adopted. These consist in cleansing vaginal douches, which should be taken in the recumbent position one or more times daily. Plain sterile water at a temperature of 110° F. will suffice for this purpose. If the vaginal portion of cervix, vagina, and vulva are infected it would be well to add an antiseptic to the douche. For this purpose the author prefers formalin in solution of 1 to 2000; lysol, creolin, or bichloride of mercury will also serve the purpose.

When the infection lies above the external os antiseptic douches will

have little advantage over plain sterile water, inasmuch as the douche water does not reach the infected area and only serves to rid the vagina and vulva of the accumulated secretions. It is essential, however, that such infective secretions be kept clear of the vaginal and vulvar surfaces lest they in turn become infected.

When the discharges have a disagreeable odor formalin is efficient. Permanganate of potassium is also a good deodorant. For the treatment of the offensive discharges from cancer of the cervix see chapter on Treatment of Inoperable Cancer of the Cervix. When necrotic tissue exists, as in decomposed placental tissue, sloughing fibroids, and malignant growths, the mechanical removal of the dead tissue by means of the curette and fingers is the first step in the correction of the discharges. Following this procedure, douches of hot sterile water with formalin 1 to 1000 to 1 to 2000 or permanganate of potassium 1 to 500 to 1 to 1000 may be given.

Pruritus vulvæ is aggravated and is often dependent upon irritating vaginal discharges. In addition to vaginal douches a dry sterile tampon of lambs' wool or a boroglycerin tampon inserted one or more times daily by the patient or nurse will prevent discharges from soiling the vulvar surface.

Nearly all leucorrheal discharges are more or less dependent upon a congestion of the pelvic organs, and hence depleting measures are of the utmost value. Such are long-continued hot douches, glycerin and ichthyol tampons, and the free evacuation of the bowels.

Finally, it must be again remarked that leucorrhea is but an expression of an existing lesion or physiological disturbance, and hence is not to be treated as a pathological entity, but suggests the underlying cause and calls for a searching examination. Having found the cause and effectively directed the treatment to it the leucorrhea will be relieved. The author has found little or no satisfaction in internal medication or in the application of suppositories for the relief of leucorrheal discharges.

The following formulæ are recommended for douche solutions:

℞—Lysol . . . . . ℥iv 120|
Sig.—Dessertspoonful to each quart of hot water. (An antiseptic douche.)

℞—Potassii permangan. . . . . ʒiiss 10|00
Aquæ . . . . . ℥viij 240|00
Sig.—Dessertspoonful to each quart of hot water. (A deoderizing douche.)

℞—Zinci sulphatis . . . . . ℥j 30|00
Div. in chart. no. xxx.
Sig.—One powder dissolved in one quart of hot water. (An astringent douche.)

℞—Aluminis . . . . . ℥iv 120|00
Div. in chart. no. xxx.
One powder dissolved in one quart of hot water. (An astringent douche.)

℞—Acidi tannici . . . . . ℥ss 15|00
Glycerini . . . . . ℥iv 120|00
Sig.—Two tablespoonfuls to one quart of hot water. (An astringent douche.)

℞—Liq. plumbi subacetatis . . . . . ℥ss 15
Tinct. opii . . . . . ℥j 30
Aquæ . . . . . q. s. ad ℥iv 120
(A sedative lotion for local application.)

℞—Zinci sulphatis . . . . . gr. viij
Aquæ . . . . . ℥viij 240 | 518
(A sedative lotion for local application.)

STERILITY

Definitions
Conditions Essential to Conception
Etiology
General Causes
Local Causes
Treatment

Definitions.—Before entering into a discussion of the various causes of sterility in women the clinical significance of the term sterility and the conditions essential to conception should be clearly understood.

By sterility is meant an incapacity for childbearing. This definition may be further qualified by the terms "absolute sterility" and "relative sterility." Sterility is *absolute* when the individual is incapable of bearing a child to the period of viability; she may conceive but habitually aborts before the period of viability. Sterility is *relative* when childbearing is not in accordance with condition, age, and length of married life. Thus the term relative sterility may be used when three years have elapsed since the last childbirth, or when conception has not taken place within three years from date of marriage. This time limit is, of course, purely arbitrary.

M. Duncan found that in one-sixth of all cases parturition occurred before the lapse of the first year after marriage, and in the second year four-sixths of all marriages were fruitful.

Again, sterility may be regarded as primary and secondary: *primary* when the conditions which preclude the possibility of childbearing are primary, and *secondary* when after the birth of one or more children there is an acquired incapacity for childbearing.

Periods of fifteen and even twenty years have intervened between successive childbirths, and this in the absence of any apparent cause for sterility.

One-child Sterility.—The term one-child sterility is applied to cases in which a child is born in due time and the mother is thereafter incapable of childbearing. The most common explanation lies in a latent gonorrheal infection which preceded the pregnancy or, more rarely, was acquired during pregnancy. Such latent infections are caused to extend from the cervix to the body of the uterus, thence to the tubes, ovaries, and pelvic peritoneum. In such an event sterility is almost the inevitable result. Other causes are lactation atrophy, puerperal non-gonorrheal infections of the uterus and its appendages, acquired displacements, lacerations, and the development of a fibroid tumor.

Conditions Essential to Conception.—The conditions essential to conception are briefly enumerated as follows:

1. Deposit of semen containing living, active spermatozoa in the upper segment of the vagina.

2. Passage of the spermatozoa through the cervix into the cavity of the uterus. It is said that spermatozoa will not live longer than twelve hours in the acid secretions of the vagina; while in the uterus and tubes they commonly retain their vitality six to eight days. Leopold reported a case of a woman in his clinic who had not had sexual intercourse for thirty-seven days prior to the operation, when, on abdominal section, living, active spermatozoa were found in large numbers in the fimbriated end of the tube. This case, with many other observations on women and lower animals, has led to the statement that fertilization of the ovum commonly takes place in the tube.

3. A healthy ovum must find an uninterrupted passage from the ovary, through the tube, and on into the uterine cavity.

4. The fertilized ovum must find a permanent resting-place on the endometrium until the period of viability.

With these definitions of sterility and the conditions essential to conception clearly understood, it is now possible to consider the factors which tend to prevent conception.

Etiology.—In seeking the cause of sterility, not only the whole range of diseases peculiar to women must be considered, but as well the general physical and social conditions of the individual. More than this, the cause of sterility is not necessarily found in the woman; fully one in six sterile marriages is chargeable to the husband. One marriage in ten is non-productive, and, with few exceptions, sooner or later the advice of the physician is sought. The subject is therefore of prime importance to the physician, and no condition more thoroughly taxes the skill of the general practitioner and specialist.

General Causes.—In determining the cause of sterility the general conditions predisposing to sterility should first be considered, and of these age is the most important. No cause of sterility approaches age in extent and power. The most prolific time of life is between the ages of twenty and twenty-four. Pregnancy may occur before the menstrual period, as so often happens in India, where it is considered a sin to let pass an opportunity for conception—a sin equivalent to infanticide. Because of this belief it is customary, in such countries, to marry before puberty. Marriages occurring between fifteen and twenty years of age are relatively sterile as compared with those occurring between twenty and twenty-five. The explanation lies in the more mature development of the sexual organs after twenty years of age. A case is recorded where a woman gave birth to twelve children before her menstrual flow appeared. Again, it is possible for pregnancy to occur long after the cessation of the menstrual period. Trento reported a case of a woman who gave birth to a child at sixty-seven years of age. Abraham was one hundred years of age and Sarah ninety when their child was born. Sarah "was old and well stricken with years, and with whom it had ceased to be as it is with women"—that is, she had ceased to menstruate. Renauden reported the case of

a woman who was delivered of a child ten or twelve years after the cessation of the menstrual periods. So, while pregnancy is possible after the menopause, the rule is that the capacity for childbearing ceases four to six years before the cessation of the catamenia.

Anemia.—Anemia, either primary or secondary to some wasting disease, such as tuberculosis, diabetes, nephritis, and malaria, is an important predisposing factor, and must always be taken into account whatever else may be found.

Consanguinity.—Marriage of near relatives is said to be a cause of relative sterility, but this statement is not confirmed. G. Darwin has proved the harmlessness of marriages between cousins, and has demonstrated the fertility of such marriages.

Obesity.—Obesity is undoubtedly a potent cause of sterility. That peculiar form of obesity associated with anemia especially conduces to sterility. Scanty nutrition has little or no influence. When a woman rapidly increases in weight she very often becomes sterile, and in such the most promising means of relieving sterility is to reduce the weight.

Alcoholism.—Alcoholism is an indisputable factor; furthermore, the death-rate among children born of inebriate mothers is double that of temperate parentage.

Sexual Instinct.—The sexual instinct evidently has some influence upon the fertility of women. While it is true that many women bear children who have never experienced sexual desire, it is the rule that women are most likely to conceive who have the greatest sexual vigor.

Sexual Excess.—Sexual excess, on the other hand, conduces to sterility through the congestion and inflammation resulting from such excesses.

Sexual Incompatibility.—Sexual incompatibility is an ill-defined condition that plays a role in the causation of sterility, though no explanation is offered. This recalls the childless marriage of Josephine and Napoleon and the fruitful remarriage of both. Many unhappy yet fruitful marriages disprove this theory. As a rule some other explanation for the sterility is found.

Influence of Temperature and Climate.—The action of heat and cold in the various zones does not appear to affect fertility.

Local Causes.—After this consideration of the general predisposing causes, the more tangible local factors must now be considered.

Dyspareunia.—Dyspareunia is not an uncommon cause of sterility, and in every case the underlying cause of painful coition must be determined. Lesions obstructing the lower genital passage, such as acquired and congenital atresia of the vulva and vagina, must be looked for, as well as overgrowths of the labia and clitoris, and tumors of the vulva, vagina, and uterus, which encroach upon the lower passages. Other lesions causing pain, such as urethral caruncle, inflammatory lesions of any portion of the genital tract, inflammation of the urethra and bladder, and painful lesions of the rectum, including fissures and hemorrhoids must also be looked for. Vaginismus without a recognizable lesion is an occasional cause of dyspareunia. It is not essential to conception that sexual union be complete. This is demonstrated by

the fact that pregnancy may occur with an intact hymen and in the presence of other evident obstructions to complete sexual union.

Maldevelopments and Malformations.—The maldevelopments and malformations of the genital organs are occasional causes of absolute sterility. The absence of any of the reproductive organs or the failure of these organs fully to develop are certain causes of sterility. A uterus partially or completely divided is not likely to become pregnant, and a septum dividing the vagina may offer an obstruction to sexual intercourse. When a woman complains of amenorrhea, or at most of a scanty, irregular flow which has persisted from a delayed puberty, it is highly presumptive that the uterus, together with the tubes and ovaries, has failed to develop beyond the infantile type. The ovaries are primarily at fault in the majority of cases, and in consequence the uterus fails to develop. While there is little encouragement in treatment of any kind, it is manifestly illogical to direct the treatment to the uterus rather than to the ovaries—a procedure akin to whipping the cart to make the horse go. The complete closure of any portion of the genital tract will result in sterility, but these conditions are rare, with the exception of closure of the tubes from inflammatory adhesions. The influence of stenosis in causing sterility is doubtless exaggerated. A congenital narrowing of the cervical canal prevents the passage of spermatozoa, but in such cases there is usually an underdevelopment of the uterus, and possibly the ovaries as well, to account for the sterility.

The vagina may be too short or too narrow to retain the semen, and the cervix may be too long to allow the entrance of the spermatozoa from the vault of the vagina, where it is usually deposited. A short cervix *per se* is not a cause for sterility; occasionally the explanation lies in an underdevelopment of the uterus associated with a short cervix.

A frequent cause of secondary sterility is superinvolution of the uterus brought about by superlactation, infection, or malnutrition.

Malpositions.—Malpositions as direct causes of sterility have been greatly overrated. Pregnancy is possible in all malpositions of the uterus with the exception of complete inversion. The underlying cause is more often in the accompanying inflammatory lesions and in dyspareunia. Chronic endometritis and ovaritis are so commonly associated with displacements, and are such potent causes of sterility, it is fair to assume that they are most often the underlying causes.

The displaced cervix is a more probable cause than is the displaced body of the uterus. The difficulty with which the semen enters the cervix when displaced forward, or to the side in backward or lateral displacement of the uterine body, will account for sterility, whereas it is difficult to conceive of the cervical canal being obstructed by the flexion of the body upon the cervix. The thick, resisting wall of the uterus will not permit of so sharp bending as to obstruct the passage of spermatozoa. Reasoning *a priori*, an extreme retroversion with the cervix pointing upward and forward would more likely cause sterility than would an uncomplicated retroflexion with the cervix

pointing downward and backward. From like reasoning, descent of the uterus, especially when associated with elongation of the cervix, as is usually the case, would be still more likely to result in sterility because of the difficulty of the semen in gaining entrance to the cervical canal.

Traumatisms.—Traumatisms to the cervix and vagina not infrequently predispose to sterility. A lacerated perineum allows of the free escape of semen from the vagina, and a lacerated cervix, followed by erosion and eversion of the cervical mucous membrane, may offer an obstruction to the semen. Rectovaginal and vesicovaginal fistulæ cause sterility by the effect of the urine and feces upon the semen, by the accompanying vaginitis and the resulting dyspareunia. Cicatricial contraction of the vagina following an injury may interfere with sexual union.

Pelvic Inflammation.—Pelvic inflammation is by far the most prolific source of sterility, and first among the various lesions is endometritis. The hyperplastic form of endometritis will most certainly cause sterility, and particularly when associated with profuse hemorrhages and leucorrhea. The diseased endometrium is an unfavorable resting-place for the ovum, and the discharges play havoc with the spermatozoa. In the cervix the increased mucous secretions of endocervicitis plug the cervical canal so effectually as to prevent the entrance of the semen. Vulvovaginitis may prevent conception through perverted acid secretions and dyspareunia. Infections of the tubes destroy the cilia and often the epithelium as well, thereby hindering the progress of the ovum through the tube to the uterus. Closure of the fimbriated end of both tubes, resulting in a distention of the tube with serum, blood, or pus, will almost certainly cause permanent sterility. Yet it is of interest to know that pregnancy has followed upon the disappearance of double pyosalpinx, a fact which speaks for conservative treatment of salpingitis.

A chronic inflammation or passive congestion of the ovary results in a hyperplasia of the connective tissue surrounding the follicles, in a thickening of the tunica albuginea, and in possible adhesions about the ovary. All this renders difficult or impossible the escape of ova into the tube.

In pelvic cellulitis and pelvic peritonitis, constricting bands of adhesions may obstruct the lumen of the tube, and so displace the uterus, ovaries, and tubes as to cause sterility. An organized exudate about the ovary will prevent the ova escaping and lead to cystic degeneration of the ovary. In all these forms of infection, dyspareunia is a large factor in the causation of sterility.

New-formations.—New-formations as causes of sterility are yet to be considered. In general, they operate through mechanical obstruction. By their presence an inflammatory reaction may develop as the prime cause of the sterility. Degeneration of the tumor leading to an irritating discharge acts in a deleterious manner upon the spermatozoa. The size of the growth is not of so much consequence as the position; a

small fibroid in the cervical canal may cause complete obstruction, while pregnancy may go on to full term in subperitoneal fibroids of enormous size. Malignant growths rarely cause sterility, because the childbearing period is usually at an end before the advent of either carcinoma or sarcoma. Sterility associated with amenorrhea in the presence of an ovarian cyst suggests the possible presence of a similar involvement of the other ovary.

Venereal Diseases.—Gonorrheal infection is a potent cause of sterility, but it is doubtful whether syphilis is often a cause of absolute sterility. (See chapter on Gonorrhea in Women).

Treatment.—A long list of general and local conditions conduces to sterility, and hence the treatment of sterility becomes equally varied. Having by examination excluded the existence of sterility in the husband and having recognized the existence of a lesion which in itself is a satisfactory explanation for the existing sterility in the wife, it is never safe to assure the patient that its correction will permit of conception and childbearing, for the reason that there are so many associated conditions which may enter into the problem and preclude the possibility of childbearing. The most the physician can say is that if a given cause or group of causes of sterility are found to exist, removal will afford greater opportunity for childbearing. When upon examination no demonstrable cause for sterility is found and the husband is known to be potent, an exploratory abdominal incision may be justified in view of the possible finding of an unrecognized lesion, such as the matting of the fimbriæ and so-called "sclerosed ovaries" (interstitial ovaritis).

Primary sterility is not infrequently chargeable to an underdevelopment of the genital organs. There is little encouragement from any treatment, though Bumm makes claims for the galvanic current. The negative electrode is placed in the uterus and the positive on the abdomen. A current not greater than 50 milliampères is used and for a time not to exceed five minutes. This treatment is given twice weekly.

Dyspareunia as a cause of sterility demands serious consideration and is often amenable to treatment. When there is no evident lesion to account for an existing vaginismus, an anesthetic should be given and the vulvar outlet and vagina thoroughly stretched. Sensitive carunculæ myrtiformes may be the cause of dyspareunia; these may be cauterized or excised. Urethral caruncle through its great sensitiveness may be the cause of dyspareunia and should be cauterized or excised.

When a vulvovaginitis or an inflammation of the organs and tissues of the pelvis exist, long-continued antiseptic douches, together with glycerin and ichthyol tampons, may be used with effect. Here operative measures may be resorted to for relief from an infected uterus and its appendages and from peritoneal adhesions. When the appendages are partially or wholly occluded, and when they are more or less involved in adhesions, there is little encouragement derived from any course of treatment so far as concerns sterility.

In endocervicitis, when the cervical canal is plugged with mucus,

the author has known of relief from sterility by the swabbing of the cervical canal and the application of mild antiseptics. Cervical polyps as a potent cause of sterility demand removal.

For a discussion of the treatment of uterine displacements and new-formations in their relation to sterility, see Chapter III.

Lacerations of the cervix, when extensive and when accompanied by eversion and erosions, should be repaired and the pelvic floor restored when greatly relaxed and torn. An elongated cervix may be the cause of sterility and should be amputated.

If hyperacidity of the secretions in the vagina exists, 2 drams of the bicarbonate of soda may be given in a quart of water at a temperature of 110° F. This douche should precede intercourse to prevent the destruction of the spermatozoa by the acid secretions.

Inasmuch as it is impossible to say that the endometrium is healthy, obscure cases of sterility are often relieved by an exploratory curettage.

The practice of artificial insemination has been practised to a limited extent. While successful in a few cases it will never find general favor.

THE MENOPAUSE

Premature Menopause
Delayed Menopause
Time of Appearance
Clinical Manifestations
Influence on Morbid Conditions in the Pelvis
Management

The menopause is a perfectly natural event in the advanced years of women, and is therefore not a cause of ill health. The popular idea that the "change of life" is a critical time in a woman's life-history is quite correct, but this does not imply that the menopause *per se* is in any way a menace to the life of a woman. It is a critical time because the menopause marks the beginning of old age, when ill health and debility would naturally be first manifest. There are, however, certain attending phenomena which disturb the comfort and general activity of previously healthy women. This discomfort is not ill health; that is to say, it is not to be dignified by the term *disease*. There is a disinclination to mental and physical exertion. The nervous and vascular systems are more or less disturbed. Functional heart troubles, associated with forebodings of impending danger, are common experiences. Hot flashes, a sense of fulness in the head, and drowsiness are complained of. The memory fails from lack of concentration, and there is a marked decline in the capacity for both mental and physical work.

These are the usual experiences of healthy women living under favorable circumstances as they pass through the menopause.

Premature Menopause.—The menstrual flow may be permanently checked at an early age, even so early as the twenty-fourth year. The causes of premature menopause are both general and local. The general causes are those referable to the disorders of the nutritive and vascular

systems—*i. e.*, primary and secondary anemias and general wasting diseases. Fright and sorrow are said to precipitate an early menopause. The local causes include the removal of the menstrual organs, also infections, degenerations, and new-formations of the uterus and ovaries. It is interesting to observe that when healthy ovaries have been removed, thereby bringing on the menopause abruptly, the usual derangements of the climacterium are exaggerated; whereas the removal of ovaries whose functions have been largely lost through disease causes little or no disturbance.

The author has observed a woman, aged twenty years, who had not menstruated for two years. She had never suffered ill health, had no evidence of a pelvic infection or other lesion, and up to her nineteenth year had menstruated every twenty-eight days, and the amount of the menstrual flow had not varied from the normal. At nineteen she stopped menstruating and the periods have not reappeared in the succeeding two years. On examination the uterus was about two-thirds the normal size of a matured multiparous uterus—otherwise the pelvic organs appeared normal.

Delayed Menopause.—The menstrual periods may be continued far beyond the average time and without anxiety when the menstrual functions appear normal. When, however, the menses become increased in frequency and in amount it becomes imperative to inquire into the cause. The general and local causes of prolonged, morbid menstrual functions are enumerated in the section on Uterine Hemorrhage. Scanzoni believes that the prolonged menopause is often due to senile rigidity and friability of the uterine arteries, while Kisch ascribes them to softening and relaxation of the uterine tissues. Undoubtedly passive congestion of the pelvis from whatever cause may prolong the menstrual period.

In the absence of all general and local causes for hemorrhage from the uterus it is possible to explain the prolonged menopause by the existence of vasomotor changes. Care must be taken to exclude the presence of carcinoma and all local lesions as well as the mentioned general factors before accepting such indefinite explanations as vasomotor changes.

Time of Appearance.—The average time of appearance of the change of life is from forty to fifty-five years of age. Scanzoni affirmed that any menstruation after fifty-three years of age should be regarded as pathological. Instances are not rare in which the menopause was recorded as not reached until sixty or more years of age. Tilt recorded one at seventy years of age, Currier ten at sixty to ninety-three years, and that of a nun is recorded at one hundred years of age. Pregnancy is known to occur after the establishment of the menopause. Piron records an abortion at the age of seventy-three. The factors influencing the time of appearance of the menopause are:

Climate.—The colder the climate the later the menopause.

Social State.—Sir Andrew Clark states that the menopause occurs earlier in the more civilized and cultured classes.

Race.—The Jews are said to reach the menopause at an earlier time than the average woman of other races in the same climate.

Heredity.—It has been frequently observed that heredity has a determining influence upon the establishment of the menopause; this tendency toward an early or late menopause may persist through several generations.

General and Local Diseases.—(*a*) Those favoring an early climacterium are: atrophy of the uterus and ovaries, superinvolution of the uterus, chronic atrophic metritis and ovaritis, postpartum hemorrhages, puerperal sepsis, and the general wasting diseases. (*b*) Those favoring a late climacterium are: malignant growths and fibroids of the uterus, endometritis, subinvolution of the uterus, and chronic metritis.

The climacterium has an average duration of three or four years, and has been known to extend over a period of twelve years. During this time the menstrual periods commonly recur at longer and longer intervals as the flow becomes more and more scant; this is known as the "dodging period."

In about one woman in seven the menses stop suddenly and permanently. As a rule, it may be stated that an abrupt ending of the menstrual periods is due to some morbid condition, general or local.

Clinical Manifestations.—The clinical manifestations of the menopause are most varied. They are seldom wholly absent, nor are they constantly present. As a rule, they recur at irregular intervals.

The general phenomena associated with the menopause are nervous disturbances, such as irritable temperament, despondency, forgetfulness, fainting, vertigo, flashes of heat and cold, perversion of taste, loss of sexual desire, and occasionally a homicidal or suicidal tendency.

The local phenomena are atrophy of the genital organs and of the breasts, and in many cases an increase in the body weight.

Under normal conditions the onset of the menopause is marked by the beginning of a retrograde metamorphosis in the ovaries, tubes, uterus, vagina and vulva, and, as a rule, these changes occur in the order named, *i. e.*, from above downward throughout the genital tract. The ovaries present a progressive thinning of the cortical zone; a gradual disappearance of ova and follicles until finally the ovary is shrunken into little more than a fibrous nodule. The Fallopian tubes lose their ciliated epithelium, the lumen is obliterated, and finally the tubes are converted into mere cords. The uterus becomes smaller in all dimensions, the uterine canal becomes distorted, the myometrium thins through atrophy and disappearance of the muscle fibers, the vaginal portion of the cervix is no longer in evidence, and the body of the uterus is finally resolved to a fibrous ridge or nodule. The vaginal walls become pale, dry, and glistening. Contraction is greatest at its upper portion, thereby forming an irregular funnel-shaped cavity. The external genitals lose their pad of subcutaneous fat, the hair becomes gray, and there is a general flattening and shrinking of the vulva.

There are no facts to substantiate the statement that the development of skin diseases is influenced by the menopause.

Influence on Morbid Conditions in the Pelvis.—It will be of practical interest to inquire into the influence of the menopause upon certain morbid conditions in the pelvis. A certain percentage of these lesions arises during the climacterium, while others are aggravated or are made to disappear by the advent of the change of life.

Foremost among the lesions that are prone to appear in the climacterium are malignant growths. Peculiar catarrhal forms of endometritis are known to arise at this time. Displacements of the uterus, and particularly prolapsus uteri, are of common occurrence as the result of retrograde metamorphosis of the uterine supports. Fibrous polyps of the cervix are said to frequently arise subsequent to and during the climacterium and are the cause of hemorrhage—a fact which the author's experience confirms.

Existing conditions in the pelvis which are aggravated by the menopause are displacements of the uterus due to relaxation of the uterine supports. A descensus may become converted into a complete prolapsus as the uterine supports relax after the menopause.

On the other hand the menstrual disturbances and pressure symptoms incident to displacements of the uterus and its appendages are relieved by the suspension of menstruation and diminution in the size of the uterus. Fibroids of the uterus very often cease to grow, and not infrequently decrease in size. This is particularly true of interstitial fibroids. While favorable changes in uterine fibroids may be hoped for at the climacterium, it must be remembered that the fibroid may be transformed into a sarcoma or into other forms of degeneration which may jeopardize life. The influence of the menopause upon existing ovarian cysts is not clearly understood. The statistics of Olshausen and others show that cysts of the ovary arise more often during the period of sexual maturity and far less frequently after the climacterium. The "involuted shrunken cysts" of Rokitansky are often the direct result of the menopause, though perhaps they more often follow upon the twisting of the pedicle. Fatty degeneration of the cyst wall is especially prone to occur during and after the menopause, and this suggests the most probable cause of spontaneous rupture of ovarian cysts at this time.

Management of the Menopause.—Every woman passing through the menopause should be under the guidance of a physician. This does not imply that she is necessarily in a critical condition, but the discomforts which invariably accompany the menopause can be lessened by judicious management. Furthermore, it is at this time when many of the infirmities of old age are initiated, and if recognized in their incipiency they may be forestalled.

It is a deplorable fact that women in general regard the menopause as a time of all sorts of serious events, and as a result of this popular impression, many serious conditions arising at this time are ascribed to the menopause; they are regarded as inevitable afflictions. They look forward to the establishment of the climacterium, when they will find relief, and thus they are deceived into serious and even fatal conditions.

Uterine hemorrhages and leucorrheal discharges are interpreted as a part of the usual workings of the menopause, and in this delusion the patient becomes the victim of an inoperable malignant growth.

It is of the utmost importance to look to the general state of health at this time. Medicine is of secondary importance, but fresh air, the judicious regulation of rest hours and open-air exercises, the selection of the diet, the regulation of the bowels and secretions, the employment of suitable baths, all are of prime importance. This is the fretful period of life, and as such the women who are passing through this trying period should be safeguarded as far as possible from petty annoyances, and should be placed in an environment most suited to their temperament. They should be consulted as to their desires and should be gratified within all reasonable bounds. It may be advisable to recommend travel or some health resort or sanitarium.

Thyroid Extract.—Thyroid extract has been extolled as a useful remedy in controlling the nervous symptoms associated with the menopause. In the author's hands there have been indifferent results in the administration of thyroid extract, and he believes this to be the experience of most clinicians.

Corpus Luteum Extract.—Corpus luteum extract is prepared in 5-grain capsules. It is a valuable remedy in controlling the disturbances incident to the removal of the ovaries, especially if given shortly after the operation and persisted in for several months in doses of 5 grains three or four times a day. The author has had most gratifying results in these cases and never fails to prescribe it. It does not give such positive results in the natural menopause, but is of some value in a limited number of cases.

CHAPTER IV

EXAMINATION OF THE BLOOD—BACTERIOLOGICAL EXAMINATION

EXAMINATION OF THE BLOOD

Morphology of Blood Cells
Red Cells
White Cells
Leucocytosis
Differential Count of Leucocytes
Anemia

By adopting a routine practice of making systematic examinations of the blood in all operative cases, the diagnosis has often been made more certain, the indications for operation have been more judiciously considered (not infrequently an operation has been postponed until the conditions of the blood improved), the choice of the anesthetic has hinged upon the blood findings, as has also the choice of operation, and finally, the prognosis has been influenced by repeated examinations of the blood.

In routine clinical work the examinations of the blood are of no less importance than the analysis of the urine. In a large percentage of cases no additional information will be afforded by examining the blood, but in those cases in which the responsibility is the greatest these examinations become of the highest value. Without a blood examination the writer would have submitted one patient with 17 per cent. of hemoglobin to an operation for hemorrhoids, and another patient with 20 per cent. of hemoglobin to an abdominal hysterectomy for uterine fibroids. In all probability the results would have been fatal from what is called surgical shock. Rest in bed and a liberal diet brought the former case up to 35 per cent. and the latter to 78 per cent. before the operations were undertaken.

It is well known how misleading mere inspection may be even in making an approximate estimate of the degree of anemia. A blood examination will often show a far greater degree of anemia than was suspected.

Morphology of the Blood Cells.—**Red Cells.**—These cells are biconcave, disk-shaped bodies of a yellowish color in the fresh state.

Size.—The diameter of the red cells in adults averages $\frac{1}{3200}$ inch and is almost constant within normal limits. In the marked anemias the diameter is more or less altered. There is little or no alteration in the mild forms of anemia.

1. Microcytes are not found in normal blood. In severe types of anemia small red cells, known as microcytes, are found in varying numbers. This is especially true of pernicious anemia.

2. Megalocytes are large red cells. They may be two and one-half times the average size of red cells. They indicate a chronic anemia of severe grade.

Shape.—Normal red cells are biconcave disks, but under certain impoverished conditions of the blood the margins present a serrated appearance (poikilocytes).

Average Number.—The average number of red cells is 4,500,000 to 5,000,000 to the cubic millimeter. This number shows great variation in the various forms of blood diseases.

Nucleated Red Cells.—Nucleated red cells are never found in adults under normal conditions.

1. Normoblasts do not differ in size from normal red cells, but contain a nucleus which occupies about one-third of the cell. They stain deeply and do not form rouleaux. In the absence of megaloblasts they usually indicate a mild type of primary or secondary anemia.

2. Megaloblasts are larger than the normal red cells and contain a large nucleus. Taken alone they certainly suggest a morbid state of the blood, but their exact significance is implied by the associated red cells. They are of greatest significance in pernicious anemia, in which they are found in large numbers, though the diagnosis may be made from the finding of a single megaloblast.

Amount of Hemoglobin.—It is of the utmost importance to estimate the relative amount of hemoglobin. The various anemias show great variations in this respect.

White Cells (Leucocytes).—Morphology.—Leucocytes are colorless bodies, varying in size and numbers of contained nuclei. As a rule they are larger than red cells. They possess ameboid movements.

Five varieties are recognized:

Lymphocytes.—Lymphocytes are both small and large. They have a round nucleus surrounded by a narrow rim of homogenous or reticulated protoplasm.

Large Mononuclear Leucocytes.—They possess a coarsely reticular, vesicular nucleus surrounded by finely reticular protoplasm. The nuclei may be round, horseshoe-shape, or elongated. The cell body is usually much larger than a lymphocyte.

Polynuclear Leucocytes.— Polynuclear leucocytes are larger than mononuclear leucocytes. Neutrophile granules are found in the reticular protoplasm. The nuclei are elongated and may be connected by threads of chromatin.

Eosinophile Leucocytes.—Large granules are found in the protoplasm and take a deep eosin stain. The nuclei are usually bilobed. In size the cell is seldom so large as a polynuclear leucocyte.

Mast-cells.—Mast-cells contain large and small basophile granules. They vary in size and in number of nuclei.

Number of Leucocytes.—The number of leucocytes in a cubic millimeter may be said to vary from 7000 to 10,000 within physiological limits. The number of leucocytes is notably increased in the newborn, during pregnancy, after ingestion of food, and after active exercise.

Leucocytosis.—An increase in the number of leucocytes above that of the normal, for the particular individual under definite conditions, is known as leucocytosis. For one individual 3000 leucocytes per cubic millimeter may be normal, while for another of greater vigor 10,000 may not exceed the normal limits. Again, a blood-count taken shortly after a full meal or during pregnancy would naturally show an excess of leucocytes as compared with other physiological conditions. For purposes of comparison the leucocyte-count should be taken at regular intervals; these counts are best taken three or four hours after eating.

In leucocytosis it is not only essential to know the number of leucocytes, but when the number is greatly in excess of the normal (25,000 to 80,000 to the cubic millimeter) it is also essential to make a differential count in order to distinguish a true splenic, myelogenous, or lymphatic leukemia from a leucocytosis incident to suppuration, pneumonia, malignancy, and other morbid conditions. In the practice of gynecology and obstetrics it is seldom necessary to resort to a differential count; but it may be stated as a safe rule to follow that when the white cell count exceeds 25,000 to the cubic millimeter a differential count should be made. This rule becomes imperative when the local findings do not suggest suppuration, pneumonia, or malignancy, and when the general anemia or enlarged spleen justifies the suspicion of a primary anemia. By the aid of a leucocyte count it becomes possible to say not only that the individual is sick, but also to estimate, to a certain extent, the degree of illness, and thereby to formulate a more definite prognosis.

Leucocytosis of Pregnancy.—In the early weeks of pregnancy there is little increase in the number of leucocytes, but in the latter half the number averages about 10,000 to the cubic millimeter in primiparæ. It is observed that leucocytosis is not so constant in multiparæ—probably not more than 50 per cent. show an average of 10,000. Near the time of labor the physiological limit may exceed 18,000. Cabot found a leucocyte count of 25,000 to 37,000 in three normal pregnancies. Since no leucocytosis is expected before the end of the third month, a blood examination will aid but little in the diagnosis of pregnancy. In the later months of pregnancy, when the question is raised as to the differential diagnosis of pregnancy from other pelvic and abdominal swellings, leucocytosis will give little clue because in almost all of these conditions it is expected that the leucocyte count will be high.

Postpartum Leucocytosis.—After childbirth, when conditions are perfectly normal, the number of white cells gradually diminishes and usually returns to that of the non-pregnant state in about two weeks. When much blood has been lost, or when there have been excessive lacerations or infection in the pelvis or breast, the usual diminution in white cells is interrupted. After-pains are said to retard the gradual diminution of the leucocytes.

Pathological Leucocytosis.—Posthemorrhagic Leucocytosis.—By experimental and clinical observations it is known that immediately after a severe acute hemorrhage there is an initial diminution in the number

of leucocytes. Very soon a rapid increase in the number of white cells takes place. Within a few hours this leucocytosis may reach 45,000, and it has been known to go as high as 62,000. In three or four days the leucocytosis gradually recedes, but seldom returns to the normal in less than a month. Leucocytosis is usually proportionate to the amount of blood lost and to the acuteness of the attack. No such condition is observed in chronic hemorrhages. The author has failed to observe leucocytosis in large but long-standing collections of blood in the pelvis from ruptured tubal pregnancy.

The increase in the number of leucocytes immediately following upon a postpartum hemorrhage is great in proportion to the amount of blood lost. This is due to the contributing influence of pregnancy, which in itself causes leucocytosis to a variable degree. The leucocytosis disappears long before the number of red cells returns to the normal. It is difficult to explain the absence of leucocytosis in occasional cases of acute hemorrhages; the explanation probably lies in the lowered resistance of the individual.

Inflammatory Leucocytosis.—It is a rule, to which there are few exceptions, that the number of white cells is increased above the physiological limit in septic infections, whether localized or general. This leucocytosis is proportionate to the virulence of the infection and to the resistance of the individual—not to the amount of exudate. A large pelvic abscess of long standing, containing no virulent microörganisms and well walled off by firm adhesions, very frequently causes no leucocytosis. The greater the resistance of the individual the greater will be the leucocytosis. That is to say, an individual with poor resistance and a virulent infection, may have no greater leucocytosis than an individual with high tissue resistance and a less virulent infection. It is observed that so long as the shock of an operation lasts, leucocytosis does not appear, but just in proportion to the reaction of the patient from shock there is a development of leucocytosis, showing that without reaction of the tissues leucocytosis will not occur. A purulent exudate usually produces a higher degree of leucocytosis than does a serous exudate, for the reason that the infection is more virulent. While it is possible for a fever to exist without an increase in the number of white cells, it is true that when the fever is solely dependent upon the infection, the leucocytosis will rise and fall with the temperature. When the individual becomes overwhelmed with sepsis the tissues fail to react, and hence leucocytosis fails to appear. The number of white cells increases in proportion to the reaction of the patient from the septic influences, and therefore may be regarded as a favorable omen rather than as evidence of increased infection.

In a large number of observations on acute and subacute cases in which pus was confined to the tube, ovary, appendix, broad ligament, or cul-de-sac, the leucocytosis usually ranged between 12,000 and 19,000, the maximum being 24,000. In long-standing pus tubes, in which the contents were sterile, the number of leucocytes did not exceed the normal. It is therefore seen that leucocytosis is not a constant factor in the

presence of pus, but is directly proportionate to the virulence of the infection and the resistance of the tissues. The white count is therefore of no little value in determining the virulence of infection. In the presence of pus localized in the pelvis the determination of an accompanying leucocytosis will lead to early interference and will at least suggest the advisability of establishing drainage through the vagina rather than through an abdominal incision.

Tuberculous pus causes no leucocytosis, and gonorrheal pus only a moderate increase in the number of leucocytes. This is explained on the theory of greater tolerance and less power of absorption of the peritoneum for these bacteria and their toxins.

Repeated leucocyte counts are of special value when taken in conjunction with the pulse and temperature. By combining these observations it is possible to make a fairly accurate diagnosis of the presence of pus and to judge something of the virulence of the infection.

In pelvic exudates, leucocytosis is a valuable indication for operative interference; the more chronic the case the greater the value. In subacute and chronic cases, with little or no rise in temperature and a leucocytosis of 12,000 to 18,000, pus is almost certainly present.

Leucocytosis of Malignancy.—In general it is said that the blood changes are proportionate to the degree of malignancy. The more rapid the growth and the greater the metastasis the more advanced the leucocytosis. In cancer of the uterus, vagina, and vulva the associated hemorrhages and infections, if acute and great, contribute to the leucocytosis. The resisting power of the individual also influences the degree of leucocytosis. The effects of sarcoma upon the blood are of the same sort, but are said to be of a greater degree than in carcinoma. In thirteen of the author's cases of malignancy there was no leucocytosis in eight. The highest white count was 16,000. Blood examinations will, therefore, aid little or not at all in the diagnosis of malignancy.

The author has not observed that leucocytosis is more marked in sarcoma than in cancer; in the two cases observed the white count did not exceed 10,000.

Leucocytosis in Ovarian Tumors.—In ovarian tumors there may be an increase in the leucocyte count. This is particularly true if the pedicle is twisted and if there is irritation of the peritoneum. The leucocyte count does not aid in determining the malignancy of an ovarian tumor, but when the red cells are diminished there is a suggestion of possible malignancy.

Differential Count of Leucocytes.—Pus may be present in the absence of any increase in number of the leucocytes. Such cases will, as a rule, show an increase in the polymorphonuclear leucocytes to over 80 per cent. In certain chronic abscess formations, both the qualitative and quantitative estimates may fail to suggest the presence of pus—these cases are exceptional.

In the hands of an expert laboratory worker the quantitative count is of great value in selected cases, but for the ordinary clinician it is of little or no value because of its technical difficulties.

Anemia.—It is of the greatest importance for the obstetrician and gynecologist to accurately diagnosticate both primary and secondary anemias. Primary and secondary anemias are not infrequent causes of amenorrhea, menorrhagia, sterility, and abortion, and hence the recognition of the extent and variety of anemia has a very special value in diagnosis. Too often the physician assumes that the disorder is a local one when in reality it is a general blood affection. It becomes imperative to know the degree of anemia before resorting to a major operation. The individual's general appearance is not a safe guide. In the cases already referred to, the one with 20 per cent. of hemoglobin and the other with 17 per cent. did not appear to be nearly so anemic, and without a blood examination, would have been operated without knowledge of the great danger.

When the history points to a primary anemia a differential blood count must be made. By cover-slip preparations and properly selected stains, chlorosis, pernicious anemia, and the leukemias are recognized. This, together with the estimate of the number of red and white cells and the percentage of hemoglobin, constitutes an exact diagnosis.

Secondary Anemia.—Secondary anemia is the result of some definite cause, such as digestive disturbances, infection, and hemorrhage. In the mildest forms it is manifested merely by diminution in the size of the red cells and a corresponding decrease in the amount of hemoglobin. The number of red cells may not be lessened. Again, the red cells may assume irregular shapes and sizes (poikilocytes, microcytes, macrocytes).

A still greater degree of anemia is manifested by a decrease in the number of red cells as well as by alteration in their shape and size. As an indication of the most advanced type of secondary anemia, there are added to the alterations in the shape and size of the red cells and to the decrease in their number, certain regenerative changes in the red cells. Nucleated red cells are found—normoblasts, microblasts, megaloblasts. During the preparation of this chapter the author had under observation a seventeen-year-old girl who had but 10 per cent. of hemoglobin and 1,200,000 red cells as the result of uterine hemorrhages caused by a fibroid tumor. In high degrees of anemia, where operative interference is indicated for relief from a pelvic disorder, the exact degree of anemia is determined before resorting to the operation. It will be of interest to inquire as to the degree of anemia which would contra-indicate an operation.

Each case must be a law unto itself. There are many things to consider: The urgency of the indication for operative interference, which may be very great in septic conditions and hemorrhage; the general condition of the patient excluding the anemia; and finally the nature of the operation, particularly as to the duration of the anesthesia required. The author has curetted and packed the uterus under chloroform anesthesia, where there was only 20 per cent. of hemoglobin; this was done for the purpose of controlling the hemorrhage until the blood could be built up to a point that would justify an abdominal

hysterectomy for the removal of a uterine fibroid. When pus can be drained through the vagina or the uterus curetted for the relief of hemorrhage it would be wise to dispense with anesthesia, when possible, if the blood is very low.

In general it may be said that there should be no protracted operation with the hemoglobin below 40 per cent. and the red cell count less than 2,000,000. There are exceptions to this rule, but all such cases must necessarily be hazardous.

BACTERIOLOGICAL EXAMINATION

Bacteriology of Normal Genital Tract
Bacteriology of Vulva and Vagina
Bacteriology of Uterus
Bacteriology of Fallopian Tubes
Bacteriology of Ovary
Bacteriology of Peritoneum and Pelvic Cellular Tissue

While the range of bacteriology in diseases of women is comparatively limited, the value of bacteriological examinations in selected cases cannot be overestimated. By these examinations it is possible to arrive at the diagnosis of the essential cause of the infection and to determine whether the pus is sterile or virulent, and, having done so, the prognosis is made with more certainty and the method of treatment is more intelligently decided upon.

The pathogenic organisms commonly found in the genital tract are the staphylococcus pyogenes albus and aureus, streptococcus pyogenes, gonococcus, colon bacillus, tubercle bacillus, bacillus lanceolatus, and typhoid bacillus. Pathogenic microörganisms less frequently found in the genital tract are the bacillus aërogenes capsulatus, pneumococcus, diphtheria bacillus, tetanus bacillus, bacillus pyocyaneus, anaërobic putrefactive bacteria, streptococcus of erysipelas, and the streptothrix actinomyces. There is great confusion in the literature regarding the relative frequency with which these organisms are found. Indeed, it is not possible to make any definite statement as to their relative frequency.

The reader is referred to special works on bacteriology for detailed descriptions of the microörganisms common to the genital tract. The author will attempt only a clinical consideration of the subject from a diagnostic point of view.

Bacteriology of the Normal Genital Tract.—The upper genital tract —*i. e.*, cervix, uterine body, tubes, and ovaries—is free from all forms of microörganisms under normal conditions. Much difference of opinion exists as to the bacteriology of the vagina in health. That numerous bacteria are found in the healthy vagina is generally recognized, but to what extent, if any, these microörganisms are pathogenic is an unsettled question. Numerous observations have been made to determine this question. Krönig, Menge, and Whitridge Williams carefully excluded the possibility of contamination, and agreed, from extended observations, that pathogenic organisms could not long exist

in the healthy vagina. Their experiments were largely carried out during pregnancy. These authors ascribe to the vaginal secretion an antiseptic action which is more pronounced during pregnancy. The vulva is rich in pathogenic as well as non-pathogenic microörganisms. This accounts for the readiness with which the vagina is contaminated. It is of interest to know that the intact vaginal and vulvar surface will not admit of infection. In order that infection of these surfaces be possible, there must be an atrium for infection acquired by direct injury, maceration of the epithelium from profuse irritating secretions, the development of malignant growths, or lastly, the devitalization and desquamation of the epithelium incident to old age. Not so with the delicate surface epithelium of the uterus and tubes. Here the infection is readily engrafted upon the healthy surface. Not infrequently an infection acquired per vaginam will primarily attack the endometrium and later the vaginal surface when the epithelial covering has been macerated by the uterine secretion.

Bacteriology of the Vulva and Vagina.—Undoubtedly various pathogenic and non-pathogenic microörganisms exist from time to time in the vulva and vagina. That they do not more frequently cause infection is due to the fact that the vulva and vagina are so well protected by stratified squamous epithelium. In infancy and old age, when the epithelium has not the resisting power found in mature life, the vulva and vagina are more susceptible to infections and especially to gonorrhea. In the newborn the vagina is free from microörganisms, but a variety of germs may enter soon after birth. It is agreed upon by all observers that pathogenic bacteria lose their virulence as they approach the cervix. This fact is due, in all probability, to the presence of lactic acid, which in turn is the product of an acid-forming microörganism discovered by Döderlein. This organism offers a restraining and often a prohibitive influence upon pathogenic organisms, thereby preventing the infection of the upper genital tract unless the organisms are carried there by hands and instruments. Certain organisms, particularly the gonococcus and streptococcus, may travel to the uterus, notwithstanding the bacillus of Döderlein.

J. Whitridge Williams made a study of the bacteria in the vagina of ninety-two pregnant women and came to the following conclusions:

"1. We agree with Krönig that the vaginal secretion of pregnant women does not contain the usual pyogenic cocci, having found the staphylococcus epidermidis albus only twice in ninety-two cases, but never the streptococcus pyogenes or the streptococcus aureus or albus.

"2. The discrepancy in the results of the various investigators is due to the technique by which the secretion is obtained.

"3. As the vagina does not contain pyogenic cocci, infection from them is impossible, and when they are found in the puerperal uterus, they have been introduced from without.

"4. The gonococcus is occasionally found in the vaginal secretion, and during the puerperium may extend from the cervix into the uterus and tubes.

"5. It is possible, but not yet demonstrated, that in very rare instances the vagina may contain bacteria, which may give rise to sapremia and putrefactive endometritis by auto-infection.

"6. Death from puerperal infection is probably always due to infection from without, and is usually the result of neglect of aseptic precautions on the part of the physician and nurse.

"All infections of the vulva and vagina are mixed infections. The gonococcus, tubercle bacillus, diphtheria bacillus, staphylococcus, and streptococcus never exist alone, though they may so dominate in numbers and clinical phenomena as to be regarded as an isolated infection."

Gonococcus Infection.—This type of infection is rarely primary during the period of sexual maturity, but in infancy and in old age when the epithelium offers less resistance, primary vulvovaginitis is relatively frequent. The gonococcus is often found in the secretions of the vagina and vulva and occasionally when the secretion is not purulent. The Bartholinean gland, or rather the outlet of the gland, is the most frequent point of attack in the vulva. It is said that the gonococcus never invades the deeper ramifications of the gland. Here, as elsewhere, the infection is mixed.

Tubercle Bacillus Infection.—This is rarely a primary infection. As a rule, the infection is secondary to that of the uterus; more rarely to the vulva, bladder, or rectum. Direct infection is possible, as is also infection through the blood.

Diphtheria Bacillus Infection.—This is commonly a puerperal infection conveyed directly to an injured tissue. The author has seen but one such case. This one responded promptly to the antitoxin of diphtheria. The nurse in attendance acquired a diphtheritic sore throat from the patient.

Aërogenous Infection.—This infection is manifested by the formation of small subepithelial cysts containing gas (emphysematous vaginitis). The infection is usually associated with pregnancy.

Bacteriology of the Uterus.—Under normal conditions the uterus is at all times free from microörganisms, both pathogenic and non-pathogenic. The normal cervical secretion is said to possess a germicidal power. Even in chronic inflammation of the uterus, bacteria are rarely demonstrated. Uterine infections are identical with those of the tube and are classified either as mixed or specific. It is highly probable that all uterine infections are mixed. The so-called specific infections are those in which a certain pathogenic microörganism (streptococcus, gonococcus, tubercle bacillus) predominates. According to Sinclair the causes of immunity from infection of the cervix are:

1. Alkaline reaction of the cervical secretion.
2. Small caliber of the cervix.
3. Increased muscular power in the walls of the cervix.
4. The downward stream of the cervical secretion.
5. Germicidal quality of the cervical secretion.

Bacteriology of the Fallopian Tubes.—Under normal conditions no microörganisms exist in the tubes. Few bacteriological examinations have been made from catarrhal salpingitis, and the results are not definite.

In the purulent forms of salpingitis a large number of observers have made careful observations. Frank T. Andrews,[1] in writing of the causes of salpingitis, has presented a valuable series of statistics collected from 28 sources. The following table was constructed by Andrews:

In a total of 684 observations the following percentages were found:

Sterile	55.0 per cent.
Only saprophytes	6.0 per cent.
Gonococcus	22.5 per cent.
Staphylococcus and streptococcus	12.0 per cent.
Pneumococcus	2.0 per cent.
Bacillus coli communis	2.5 per cent.

Gonococcus.—The gonococcus of Neisser was found 155 times in 308 cases in which microörganisms were demonstrated. Without doubt a large proportion of the sterile tubes was originally infected by the gonococcus. The gonococcus frequently escapes detection because it disappears early from the pus contents of the tubes, and it is extremely difficult to recognize the gonococcus in the wall of the tube, though they have been known to exist many years. In 36 cases of gonorrheal salpingitis, other bacteria were found in 5.

Streptococcus and Staphylococcus.—These two microörganisms are considered together, first, because they so commonly coexist, and, second, because their anatomical effects are much the same. Their virulence in the tube is variable.

Pneumococcus of Fränkel.—The pneumococcus infections of the tube, which have been reported, bear no relation to pneumonia. The infection of the tube is probably acquired in these cases by direct extension from the lower genital tract.

Bacillus Coli Communis.—This infection is very often mixed, the colon infection being usually secondary to other forms. In the majority of cases the presence of the colon bacillus implies adhesions binding the tube to the bowel, though, as stated by Andrews, the infection may extend through the bowel wall, along the peritoneum to a non-adherent tube, or may travel up through the genital tract.

Typhoid Bacillus.—No direct connection has been traced between typhoid infection of the tube and typhoid fever, though it is possible that the typhoid bacillus may exist in tissues years after an attack of typhoid fever.

Saprophytic Bacteria.—Non-pathogenic bacteria of the saprophytic order are not infrequently found in salpingitis.

Infectious Granulomata.—Of the infectious granulomata, tuberculosis ranks first in frequency and in clinical importance.

[1] American Journal of Obstetrics, February, 1904.

Tuberculosis.—In a total of 100 cases of pyosalpinx collected by Andrews, 10 per cent. were tuberculous. The tubes are usually the primary seat of genital tuberculosis—57 out of 67 cases (Meyer). On the other hand, Orthmann states that primary tubal tuberculosis occurs in 18 per cent. of genital tuberculosis in women; this in a series of 168 cases. Secondary tubal tuberculosis is relatively common, and is most often acquired through the blood.

Syphilis.—Syphilis is rarely identified in the tube. Undoubtedly syphilitic lesions of the tube are common to general syphilitic infection, but it is difficult to identify them as such. But three cases are recorded.

Actinomycosis.—Actinomycosis of the tube is a great rarity.

Bacteriology of the Ovary.—Infections of the ovary are almost without exception secondary to tubal infection, and hence the bacteriology of ovarian abscesses is in most part identical with that of purulent salpingitis. Primary ovarian abscesses are exceedingly rare, though the possibility of infection travelling to the ovary by way of the blood-lymph channels or directly through the genital tract without visible effects until the ovary is reached, cannot be denied. Sutton says that primary ovarian abscesses are always tuberculous. This statement is not verified by experience. Martin collected 55 cases of ovarian abscesses from the literature, and of this number 35 contained bacteria, the remaining 20 were sterile. The gonococcus and the bacillus coli communis were the most frequently found. Staphylococci, streptococci, pneumococci, and the typhoid bacillus were relatively infrequent. The rule that bilateral infection of the appendages speaks for gonorrhea and unilateral involvement for puerperal infection has many exceptions. Suppurating ovarian cysts have been discussed by Cumston. Dermoid cysts are particularly susceptible to infection and the development of abscesses. The organisms which have been mentioned have been found in these cysts. Inasmuch as suppurating cysts are almost invariably adherent to the bowel, the colon bacillus is of common occurrence, but more often as a secondary infection. The size of the abscess is no criterion of the virulence of the pus. Fraisse removed a cyst containing fifteen liters of sterile pus. Such abscesses at one time undoubtedly contained either pathogenic or saprophytic organisms. The periodic congestion of the ovary and rupture of the Graafian follicles, together with the tendency of the ovary to the formation of newgrowths and to torsion of the pedicle, render the ovary peculiarly susceptible to infection.

Streptococcus and Staphylococcus.—These infections are common; they frequently follow upon labor and abortion. The virulence of the infection and the resistance of the individual determine the clinical picture. The lesion in the ovary is but a part of the more general infection of the lower genital tract and occurs at intervals of days, weeks, and months subsequent to the initial infection.

Gonococcus.—This infection doubtless ranks first in point of frequency. Reymond affirms that the gonococcus always attacks the surface of

the ovary, and is never found in the pus of an ovarian abscess. The gonococcus can enter the substance of the ovary through the blood and lymph channels and through the follicles and corpora lutea.

Bacillus Coli Communis.—This is said to never occur in the absence of adhesions binding the ovary to the bowel. The infection is consequently mixed in the majority of cases. It is probable that the infection travels also through the genital tract to the ovary.

Pneumococcus.—This form of infection has been recorded by several observers. A pure culture of the pneumococcus has been obtained from the pus in the abscess. In none of the cases was there a recent history of pneumonia.

Tubercle Bacillus.—This infection is by no means so infrequent as the early writers would have us believe. Miliary tubercles are observed by the microscope in ovaries that appeared perfectly normal. Primary infection of the ovary is most unusual. The infection is almost invariably secondary, but it is not always possible to determine the initial point of infection. It is generally believed that the tubes are the primary seat in the majority of cases. Schottländer believes the peritoneum to be the primary source of the infection, but does not exclude the tubes as a possible source. It is, of course, possible for the tubercle bacillus to pass from the vagina by way of the uterus and tubes to the ovary, or from the vagina through the broad ligaments to the hilum of the ovary. In general miliary tuberculosis the ovary is especially liable to be attacked by way of the blood. In 48 cases of ovarian tuberculosis Orthmann traced the infection to the tubes in 26 and to the peritoneum in 22.

Bacteriology of the Peritoneum and Pelvic Cellular Tissue.—The involvement of the peritoneal and cellular tissues of the pelvis is almost invariably secondary to infections of the uterus, tubes, ovaries, cervix, vagina, bladder, or rectum. The bacteriology of pelvic cellulitis and peritonitis is therefore that of vaginitis, metritis, salpingoövaritis, cystitis, and proctitis. In puerperal infection the streptococcus and staphylococcus are about equally liable to infect the pelvic cellular tissue and peritoneum. Not so with the gonococcus and tubercle bacillus, which attack by preference the peritoneum. The colon bacillus and tubercle bacillus doubtless very frequently pass through the bowel to the peritoneum and cellular tissue, though with these organisms, as with all others, the usual avenue of infection is the genital tract.

CHAPTER V

GENERAL PHYSICAL EXAMINATION—EXAMINATION OF EXTERNAL AND INTERNAL GENITALS

GENERAL PHYSICAL EXAMINATION

Preliminary Measures
External Abdominal Examination
Inspection
Palpation
Percussion
Auscultation
Mensuration

Preliminary Measures.—After the history has been taken, the next step is to determine by a general physical examination the possible bearing which some remote affection may have upon the pelvic organs.

Giving attention more particularly to the abdomen and pelvis, the following outline will serve to indicate the methods to be employed in a systematic and thorough physical examination, as well as the order in which practical experience has sanctioned their usage.

No invariable order can be adopted; circumstances will alter the general routine; but it is well to follow a definite method of procedure as closely as possible. The habit of making a systematic routine examination will not infrequently eliminate many errors in diagnosis. The examiner will not likely be content with any single explanation for the patient's complaint, but will seek farther for other possible lesions. The writer recalls a case in which hemorrhage was the symptom complained of. On physical examination an interstitial fibroid was discovered. This was believed to explain the hemorrhage, and a hysterectomy was performed. In the cavity of the uterus was a cauliflower carcinoma, which had not been suspected. The examination had not been complete; when a single cause for the hemorrhage was discovered no further search was made. Had a more conservative operation been performed and the uterus not removed, the more serious of the lesions would have been overlooked. *We learn from such experiences that we should not be content with the finding of a single cause for a given ymptom, but should search for all possible causes, inasmuch as two or more morbid conditions may contribute to the symptom.*

In making a physical examination care should be taken not to injure the structure examined; and the examiner should always endeavor to avoid inflicting pain. The more skilled the examiner the more careful and gentle he is. A vaginal examination may cause great discomfort, and serious damage may be done to an inflamed mucous membrane

or malignant growth. As the result of a bimanual examination roughly made, not only much suffering may be caused, but cysts may be ruptured, abscesses may break into the peritoneal cavity, the gestation sac of an ectopic pregnancy may be ruptured, adhesions may be torn, and in the use of the sound, curet, and speculum, serious and even fatal injuries may be sustained. While an exact diagnosis is desired in the first examination, it is seldom absolutely necessary and is frequently impossible. Certain procedures, such as catheterizing the ureters, must often be postponed for a subsequent examination.

It is seldom necessary to make an examination during the menstrual period. It is not only objectionable to the patient, but at this time the pelvic viscera are congested, and there is an added risk of injury. During the menstrual period the cervix is softened and somewhat patulous, and for this reason Simpson has advised the exploration of the uterine cavity during menstruation for the detection of foreign growths. The added risk of infection and injury would seem to contra-indicate such a practice.

The intermenstrual period is therefore chosen for local examinations and treatments, for the reasons that the conditions then found are more nearly normal and there is less risk of injury. Furthermore, it is best to make the examination at a time when the patient is in a condition the nearest possible to the normal. To this end the examination should not be made immediately after a full meal, or when for any reason the patient is exhausted and nervous.

Whenever possible the patient should be examined on a table in a good light. Whatever the table used it should be of convenient width and length to permit the patient to assume any desired position. It should be so placed as to be approached by the examiner from all sides, and should be of convenient height to allow him to proceed without assuming an unnatural and strained attitude.

Fig. 14 shows a correct table for the making of examinations and operations. This table was designed by Dr. L. E. Schmidt, of Chicago, and has the special advantage of directing the buttocks well over the edge of the table, thereby favoring instrumental examinations of the bladder, vagina, and rectum.

Frequently a patient must be examined on a bed or couch. The author does not favor the examining chair because of its formidable appearance, its cumbersome weight, and the inconvenience with which the position of the patient is changed.

External Abdominal Examination.—Inspection.—It is well to expose the abdomen by removing the corset and all constriction about the waist. A sheet should cover the upper portion of the trunk to the waist line; another sheet should cover the lower extremities and hips, as seen in Fig. 15.

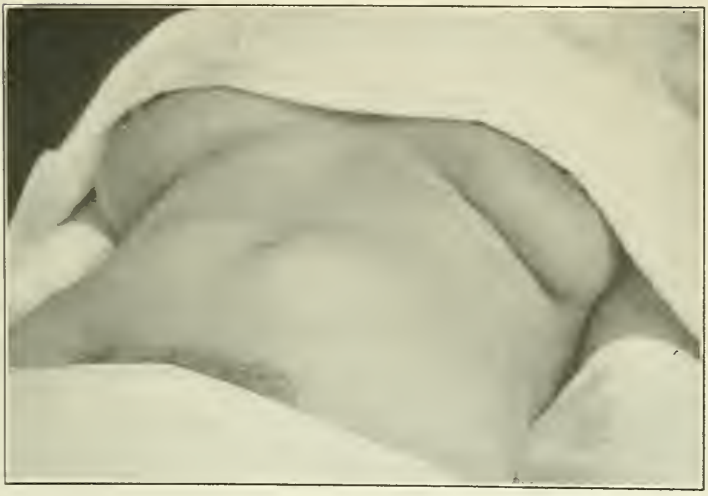
The chief value of inspection is to determine abnormalities in the contour of the abdomen. Among the points to be observed are the size of the abdomen, its form, the site of a convexity or depression, the laxity or tension of the abdominal wall, the retraction or protrusion

of the umbilicus, the presence of linea albicantes, pigmentations, distended veins, hernia, skin diseases, peristaltic movements of the intestine, pulsations of the aorta as seen through the thin abdominal

FIG. 14

Examining table. (Schmidt.)

FIG. 15

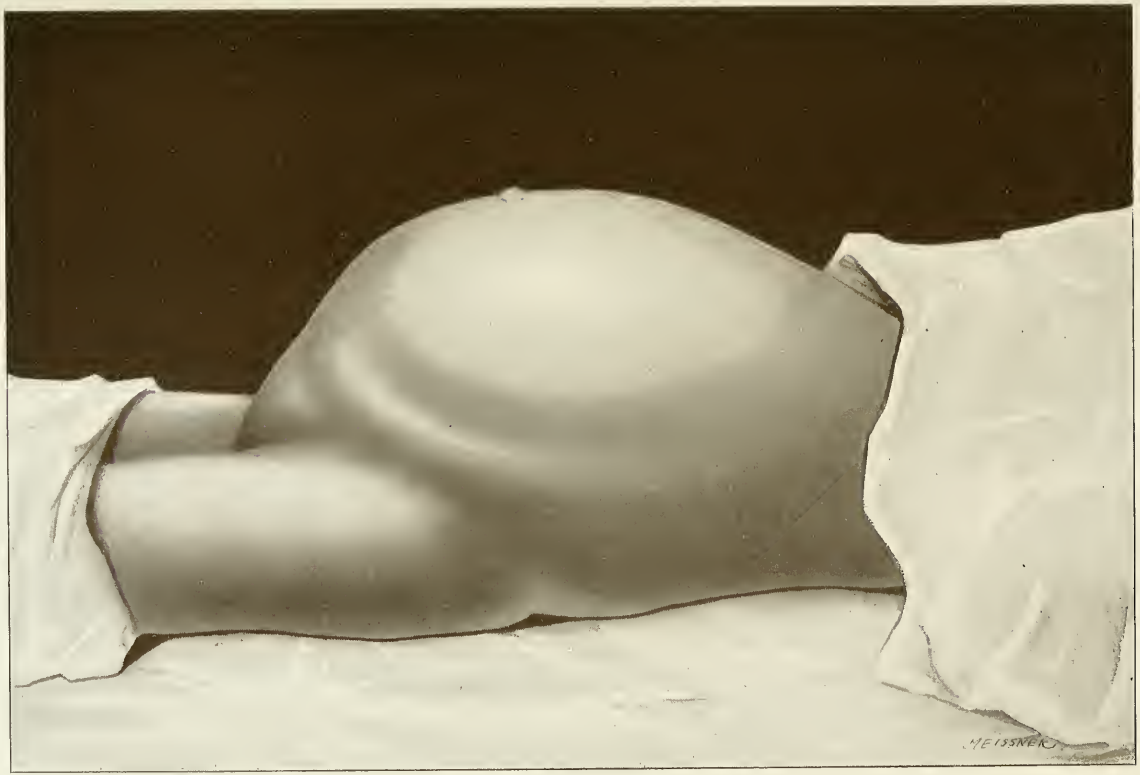


Position for abdominal examination.

PLATE I

The abdominal walls are thick and greatly relaxed. Free fluid has accumulated in the most dependent portions of the abdomen, causing the flanks to bulge.

PLATE II



The abdomen is distended with free fluid in the peritoneal cavity. The flanks bulge. The abdomen is less prominent than in Plate VI.

wall, and fetal or respiratory movements. Variations in the contour of the abdomen produced by tympany, ascitic fluid, tumors, and thick parietes are readily recognized by a competent observer.

In a thick, fatty abdominal wall the abdomen is flattened and the flanks protrude and sag downward when the patient lies on her back. Great transverse folds are formed. (See Plate I.)

Free ascites, with the patient in the dorsal position, causes a bulging in the flanks and a flattening of the anterior abdominal wall. With change in position of the patient the contour of the abdomen is altered. (See Plate II.)

In ovarian cysts the abdomen is irregularly ovoid. In the very large cysts, or where the pedicle is long and the cyst is freely movable, the abdomen may be evenly distended. When the abdominal wall is thin and the cyst large and multilocular, it is sometimes possible to see the irregular elevations through the abdominal wall. (See Plate III.)

Large uterine fibroids may evenly distend the abdomen, but more frequently cause an irregular protuberance. (See Plates IV and V.) In interstitial fibroids the abdominal enlargement is inclined to be more median than in ovarian cysts. (See Plate IV.)

In excessive distention of the abdomen the skin is white and shiny, and often streaked with irregular red lines.

Additional information may be gained by watching the movements of the abdominal wall. The excursions of the abdominal wall are restricted during respiration by the presence of painful lesions within the abdomen, such as peritonitis, circumscribed abscesses of the abdominal viscera, intestinal obstruction, and intraperitoneal hemorrhages. Large abdominal tumors also inhibit the excursions of the abdominal wall over the region occupied by the tumor. Tumors of the upper abdomen, if not firmly adherent, will usually move with the respirations, while pelvic tumors are not affected by the respiratory movements.

Inspection is of assistance in recognizing the presence of a living fetus *in utero*. The active fetal movements may be seen and the intermittent contractions of the pregnant uterus are discernible. In intestinal obstruction the peristaltic wave may be seen to pass in the direction of the distended gut.

Pigmentation of the skin in the median line of the abdomen suggests a previous pregnancy, as do also striæ.

Palpation.—The abdomen is best palpated with the patient in the dorsal position. The head and chest, if elevated, will diminish the field of exploration. When it is desired to note the effect of change in position upon the abdominal contents, the erect, the knee-elbow, or the lateral position may be assumed.

Preliminary to all abdominal and pelvic examinations, the bladder and rectum must be empty and all constricting bands of clothing removed. The examiner's hands should be warm and the finger nails cut short. Both hands should be used. They should be laid gently upon the abdomen, with steady and firm pressure, avoiding all sudden

and unexpected movements. The patient should be instructed to breathe quietly, with the mouth open. Her attention may be drawn from the examination by asking questions concerning some other portion of her body. In this manner, with the abdominal walls thin and relaxed, it may be possible to palpate the projecting vertebræ, the posterior wall of the pelvis, the promontory of the sacrum, and the pulsating aorta.

Thick and tense abdominal walls may prevent satisfactory palpation of the abdomen, thereby necessitating an anesthetic. Very often, by care and patience, the tendency to contract the abdominal walls may be overcome without resorting to anesthesia. Remember that it is possible to do harm by rupturing collections of blood, cysts, and abscesses, and by exciting a limited or latent inflammation to extend to surrounding structures.

Fig. 16

Palpation of the colon.

For convenience of description the abdomen may be divided into quadrants (Fig. 17). These are named respectively the right upper, the left upper, the right lower, and the left lower quadrants.

Before determining the nature of a swelling, it is necessary to identify it either as growing from the pelvis or from the abdomen, and to demonstrate its relation to the viscera and to the abdominal wall.

It is well to follow a routine system, beginning below and proceeding upward. If the preliminary step of emptying the bladder and bowels is taken there should be no confusion with a fecal tumor and distended bladder. Sensitiveness, tension, thickness, and consistency of the abdominal wall are noted by systematically palpating symmetrical

PLATE III

The abdomen is evenly distended by a large ovarian cyst, and is symmetrically distended. There is no bulging of the flanks.

PLATE IV

The abdomen is distended by a single large interstitial fibroid of the uterus. The tumor is firm, smooth, and located in the median line.

parts and comparing them. No considerable pressure need be exerted in determining these facts. When sensitiveness is found nervous irritability and inflammation should be carefully distinguished. When deep pressure is tolerated in the presence of superficial tenderness, inflammation can be almost surely excluded. All tumors of the abdominal wall move with the wall, and may be lifted up with it. The connection of a tumor with the skin is recognized by inability to lift the skin apart from the tumor.

Fig. 17

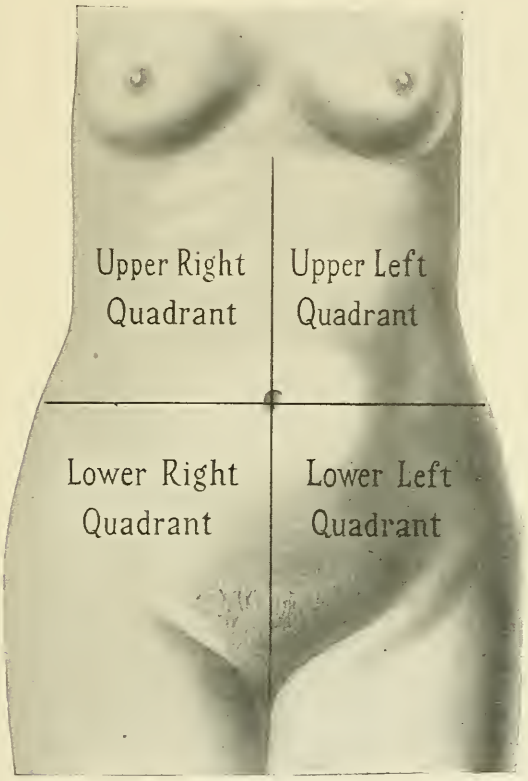


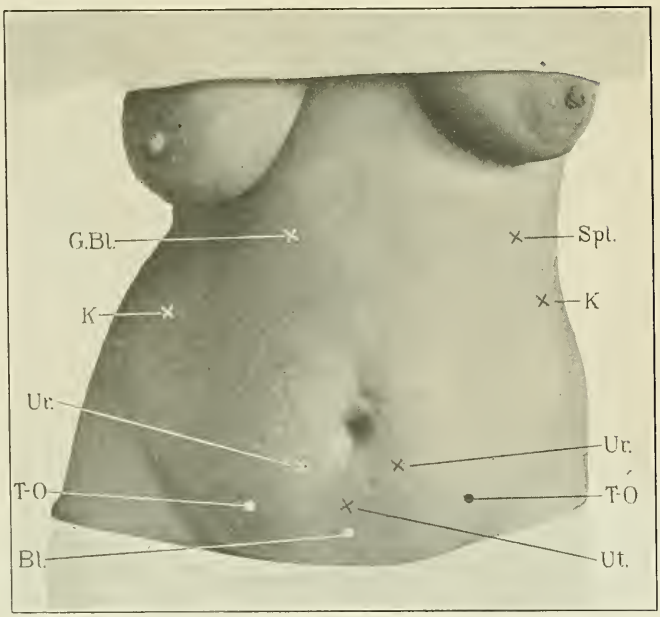
Diagram of the areas into which the abdomen may be divided.

All intraperitoneal tumors and viscera move with respiration; the nearer the diaphragm the greater the excursions. If the organ or tumor is adherent or is incarcerated the excursions will be limited. These isochronous, respiratory movements are readily recognized by the hand, and under favorable conditions may be recognized by inspection. An organ or tumor lying underneath the peritoneum, if protruding into the peritoneal cavity, may be affected by respiratory movements. Such, for example, may be the case with a movable kidney or a pedunculated

Fig. 18

Demonstrating the thickness of the abdomen.

Fig. 19



Showing position of various organs. *G.Bl.*, gall-bladder; *Spl.*, spleen; *K*, kidney; *Ur.*, ureter; *T-O*, tube and ovary; *Ut.*, uterus; *Bl.*, bladder.

PLATE V

A multiple fibroid tumor of the uterus unevenly distends the abdomen. The abdominal wall is thin, permitting the irregular contour of the tumor to be distinctly seen and palpated.

PLATE VI

Hernia of a pregnant uterus. A five months' pregnant uterus forms an abdominal tumor protruding between the separated recti muscles.

subserous fibroid. All tumors arising in the pelvis tend to grow upward.

The contour of the swelling and its consistency are determined by palpation. It is important to recognize periodical alterations in consistency in connection with the differential diagnosis between pelvic or abdominal swellings and a pregnant uterus. No swelling other than a pregnant uterus contracts intermittently. The softening of a tumor speaks for a degenerative process. When the swelling is deep-seated or the abdominal wall thick and tense, it may be impossible to determine the consistency and contour of the swelling. Fluctuation is best detected by percussion associated with palpation, and when elicited speaks for the presence of fluid. The readiness of response to impulse, indicates to some extent the consistency of the fluid. The examiner is often at a loss to decide whether or not fluid is present. Tense cysts may not fluctuate, and, on the other hand, soft tumors may appear to fluctuate.

The connection of the swelling with other tumors and viscera may be determined by palpation. The exact location of the tumor is noted, and by palpation is often traced to a particular organ. By changing the position of the patient, additional information may be obtained regarding the attachment of the swelling. Spencer Wells has pointed out that non-adherent, pedunculated tumors of the pelvis gravitate into the abdominal cavity when the knee-chest position is assumed.

Percussion.—The abdomen is best percussed with the patient in the dorsal position. When it is desired to demonstrate by percussion the change in position of a tumor or fluid, the patient may assume any required position.

Since the normal percussion tone of the abdomen differs according to the contents of the stomach and bowels, the results obtained by percussion are not altogether reliable. The normal range of motion in the abdominal and pelvic viscera also adds to the uncertainty of the conclusions arrived at by percussion. Furthermore, it is impossible to compare the percussion note on corresponding sides as is done in percussing the chest. Percussion is to be regarded as an auxillary to palpation.

In proceeding it is well to go over the entire abdomen in a systematic manner. If firm pressure is made by the fingers the intestines, unless adherent, will be pushed aside, and the underlying organ or tumor can be directly percussed. Percussion is of the greatest value in demonstrating the presence or absence of intestine lying in front of the organ or tumor. All other conditions are better elicited by palpation.

In ascites the dull percussion note of the fluid is found in the most dependent portion of the abdomen, and the tympanitic note of the intestine is found above the fluid. When the mesentery is short or the bowel fixed by adhesions, the above findings are not elicited. If gas does not distend the intestine, or if fecal matter fills the intestine, the tympanitic note is not elicited in contrast to the dull note of the fluid. When the ascitic fluid greatly distends the abdomen there may be no change in

FIG. 20

Breaking the fat wave in percussing for fluid in the abdomen.

FIG. 21

Demonstrating the percussion wave in abdominal ascites.

the area of dulness. When there is a small amount of ascitic fluid the intestine may float to the side of the abdomen and give a tympanitic note together with fluctuation.

When an ovarian cyst distends the abdomen the percussion note is dull in front and the tympanitic note of the intestine is found low in the flanks.

Auscultation. — This is of little value except in the diagnosis of pregnancy, but should be a part of the routine examination in all abdominal swellings which resemble pregnancy. Other than the sounds referable to the fetus, the placenta, and the pregnant uterus, there may be heard over the abdomen the maternal heart tones, pulsations of the aorta, murmurs of abdominal aneurysms, gurgling of gas in the bowel and stomach, and the friction sounds caused by the rubbing together of rough surfaces.

The patient should be in the dorsal position, with the legs sufficiently flexed to relax the abdominal walls, yet not to the extent of interfering with the examination. The ear or stethoscope may be employed, preferably the latter.

The uterine bruit is not to be mistaken for the bruit that is heard in about 50 per cent. of uterine tumors and occasionally in ovarian cysts. A similar bruit has been heard over the tumors of the liver, spleen, and the retroperitoneal spaces. No such sound has been heard over tumors of the kidney.

Mensuration. — This is of some importance in the diagnosis of abdominal swellings. It finds its greatest service in obstetric practice. It is a fairly precise means of determining the rate of growth of an abdominal swelling.

Exact measurements are difficult, because of the variable degree of distention of the intestine and the shifting of the abdominal tumor. There must be a convexity of the abdomen; otherwise, comparative measurements would be of no value.

An ordinary tape-measure will answer the purpose. The measurements to be taken are: the greatest circumference, the circumference at the level of the umbilicus, the distance from the ensiform cartilage to the pubis, from the umbilicus to the anterior superior spine of the ilium on either side, and the distance from the linea alba to the spine of the vertebræ. It is important for the purpose of comparison that the same position be assumed in making subsequent measurements.

CHAPTER VI

EXAMINATION OF EXTERNAL AND INTERNAL GENITALIA

Inspection of External Genitals
Digital Examination of Internal Genitals
Digital Examination of Vagina
Combined Vaginal Examination
Abdominovaginal Examination
Palpation of Ureters through Vagina
Digital Examination of Rectum
Pelvimetry

Inspection of the External Genitals.—The routine practice of inspecting the external genitals is unnecessary, and should be discountenanced. When required the Sims position or the ordinary lithotomy position is assumed. The sheet is drawn about the lower extremities and tucked about the vulva in such a manner as to make the least possible exposure. The labia are held apart by the thumb and index finger for the inspection of the vestibule, urethral opening, hymen, and the perineum.

When gonorrhea is suspected the urethra and Bartholinean glands should be inspected. When these structures are infected, and particularly if pus can be expressed from the urethra, the diagnosis of gonorrheal infection amounts to a moral certainty.

Recent injuries should be inspected, but long-standing injuries to the pelvic floor can be detected and a fair estimate of their extent gained from the sense of touch alone.

Malformations, pigmentations, varices, edema, and all the new-formations should be examined by direct inspection.

Digital Examination of the Internal Genitals.—The hidden position of the internal genitals makes it necessary to examine them through one or more of the natural openings—*i. e.*, rectum, bladder, and vagina. Until the end of the eighteenth century the vaginal route was the only one used for such examinations. Little progress was made in the diagnosis of diseases of the internal genital organs until combined methods of examination were introduced by M. Puzos, in the eighteenth century, and revived and elaborated by Sir James Y. Simpson.

The combined examination is the only means of determining the size, position, consistency, mobility, sensitiveness, and relative positions of the pelvic organs.

Digital Examination of the Vagina.—This is made with the patient in the Sims or lithotomy position, and rarely in the erect or knee-chest position. When the bare hand is used it should be scrubbed with soap and water and disinfected with lysol. The best lubricant for the examining finger is scented green soap. Vaseline is not desirable, because

FIG. 22

Patient prepared for inspection and vaginal examination in the office.

FIG. 23

Patient prepared for inspection and vaginal examination. Hips drawn to the end of the couch and feet resting on stools.

of the odor from the secretions, which clings to the fingers in spite of vigorous scrubbing. In an ordinary digital examination of the vagina it is unnecessary to expose the vulva; the examination may be made in a perfectly satisfactory manner under cover of a sheet.

It should be the invariable practice of physicians to wear a thin rubber glove or finger-cot (Fig. 26) in making vaginal and rectal examinations. This is done not only as a matter of cleanliness in preventing septic infection of the genital organs, but as well to prevent infection of the examining finger. A well-known authority on skin and venereal

FIG. 24

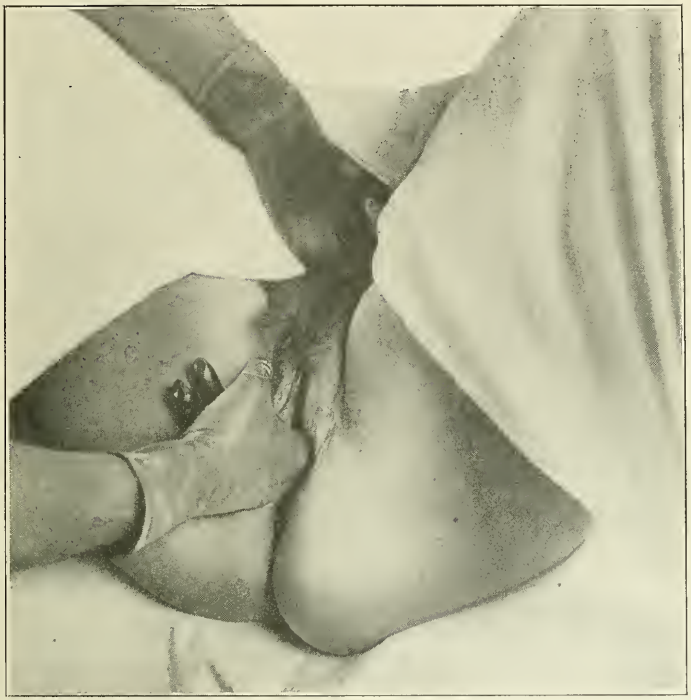
Vaginal examination with two fingers. Step 1. The perineum is forcibly depressed by the palmar surface of the middle finger, thereby increasing the vaginal outlet.

diseases has informed the author that an average of one physician a week came to his office with a syphilitic infection acquired in making examinations. This appalling statement should make the examiner very cautious.

The attitude of the examiner should be carefully considered. Fig. 27 shows the correct position, though the table is somewhat high for convenience and efficiency. The examiner stands at the end of the table; one foot rests upon a low stool; the elbow of the examining arm rests upon the knee, thereby permitting free motion in the forearm and hand.

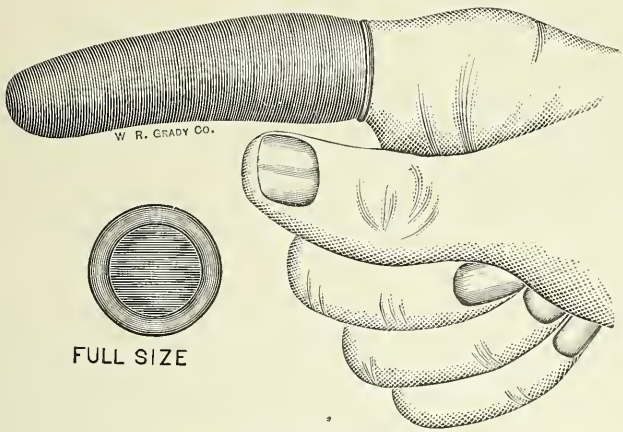
Choice of Hand.—The choice of hand will depend in part upon the comparative utility of the two hands, but more upon the habit acquired.

FIG. 25



Vaginal examination with two fingers. Step 2. Index finger is inserted above the middle finger and into the vaginal outlet.

FIG. 26



Finger-cot worn on the index finger.

As a general thing, the right side of the pelvis is best palpated with the right hand, and the left side with the left hand. In the early experience of the examiner it is best to cultivate the sense of touch in a single hand, and in later years, as there are opportunities for more experience, either hand may be used, with equal expertness.

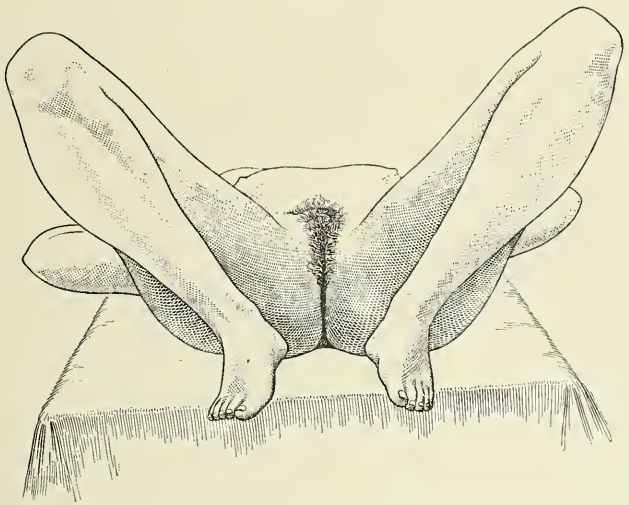
FIG. 27

Combined vaginal examination.

Number of Fingers.—When two fingers can be introduced without discomfort to the patient, the two will be found more effective than one. In order that the fingers may be introduced with the least possible annoyance to the patient, the labia are separated by the thumb and index finger. The middle finger of the opposite hand is inserted into

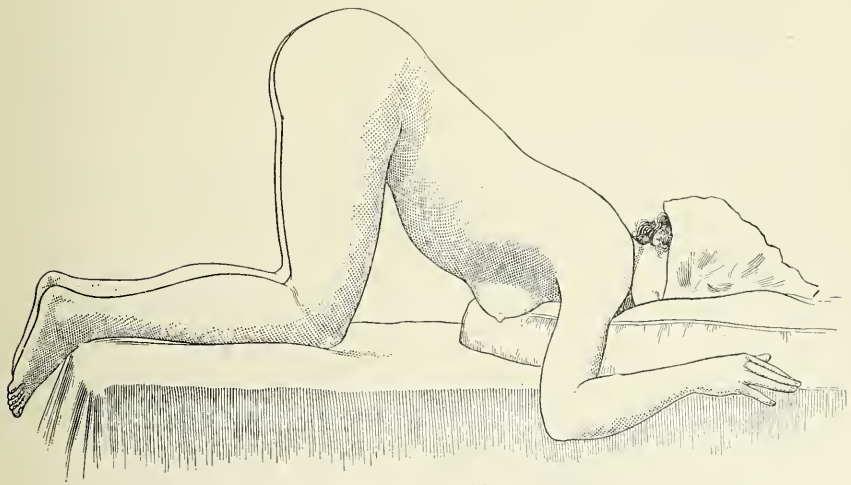
the vulvar opening, with the palmar surface resting upon the perineum. Firm pressure is made by the finger upon the perineum. The vulvar outlet is thereby deepened, and into it the index finger can be readily inserted (Fig. 24). The two fingers are now passed into the vagina,

FIG. 28



Lithotomy position.

FIG. 29



Knee-chest position.

making firm pressure upon the perineum and avoiding pressure upon the clitoris and urethra (Fig. 25). When the fingers are fully inserted the palm of the hand is turned upward. When the vulvar outlet is small, the mucosa sensitive, or the hymen intact, a single

finger should be employed. When pain is caused by inserting the finger it is well to ask the patient to bear down while the finger is being introduced.

FIG. 30

Inspection of the vagina and cervix with patient in the knee-chest position.

The following conditions are determined by a simple vaginal examination: the size, form, and position of the vulva, vagina, and vaginal portion of the cervix; the condition of the hymen, whether present or absent, perforate or imperforate; the integrity of the pelvic floor; the presence of newgrowths in the vulva, vagina, and vaginal portion of the cervix; sensitiveness and fulness in the vault of the vagina and the capacity of the pelvic outlet.

The knee-chest position is especially advantageous when it is desired to do away with intra-abdominal pressure for the purpose of permitting the uterus and freely movable pelvic tumors to rise out of the small pelvis.

The erect position is practised chiefly in determining the degree of prolapsus of the uterus.

After concluding the examination the finger is withdrawn and the secretion on the finger inspected.

The Combined Vaginal Examination (Bimanual).—Bishop says: "The secrets of success in bimanuel examinations are: a warm hand, a gentle

touch, and patience. Any hurry is fatal." The advantages of a combined examination over a simple vaginal or rectal examination are evident. The combined method may be regarded as the most valuable of all physical explorations of the pelvis. Various combinations may be utilized, they being designated as abdominovaginal, abdominorectal, abdominovesical, abdominovesicovaginal, abdominovesico, and rectovaginal.

As a preliminary step to the examination, the bladder and rectum are emptied, all clothing is made loose about the waist, and the patient placed in the lithotomy position.

Abdominovaginal Examination.—In order that this method of examination be properly performed, the vagina must be patent and its walls relaxed. Furthermore, it is essential that the abdominal walls be sufficiently thin and relaxed to permit of depression. When there is much fat in the abdominal wall, a pendulous abdomen, or tenderness and pain on pressure, little or nothing can be accomplished by this method without the aid of an anesthetic. In extreme elongation of the vagina, and when there is an excessive deposit of fat in the external genitals and thighs, it may be impossible to palpate high in the vault of the vagina.

FIG. 31

Erect position.

The bimanual examination is best performed in the lithotomy or dorsal position, with the thighs slightly flexed. Little can be gained from such an examination with the patient in the erect or knee-chest position. The side positions, while awkward and ill-adapted for general use, are of special service in testing the mobility of the pelvic viscera and tumors.

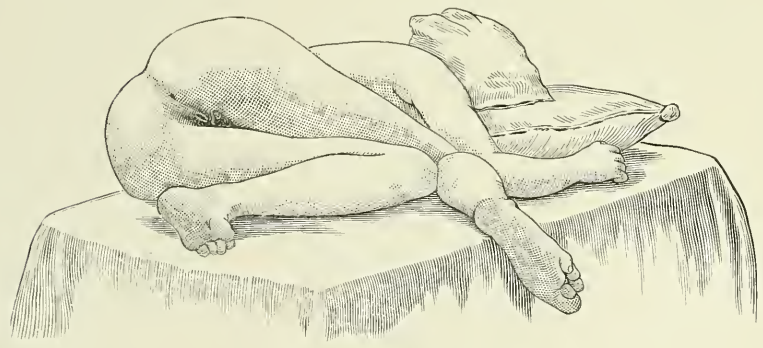
All that has been said in describing the digital examination of the vagina concerning the choice of hands, the use of one or two fingers, and the manner of introduction of the fingers, will apply to the combined method of examination. The function of the hand upon the abdomen is to steady the pelvic organs while being palpated by the fingers in the vagina. A complete outlining of the pelvic viscera by the external hand is not possible, consequently light pressure is all that is required, and has the advantage of not exciting the abdominal

muscles to contract. The tips of the fingers are directed toward the ensiform cartilage and gradually made to compress the abdominal wall at a variable point above the symphysis pubis. With a thin, flaccid abdominal wall, in the absence of large swellings, the external and internal fingers may be approximated in front of the uterus with only the vaginal wall, the bladder, and the abdominal wall intervening. Under most favorable conditions the fingers may be similarly approximated behind the uterus. Lifting the uterus forward and upward by

FIG. 32

Back view of Sims' position.

FIG. 33



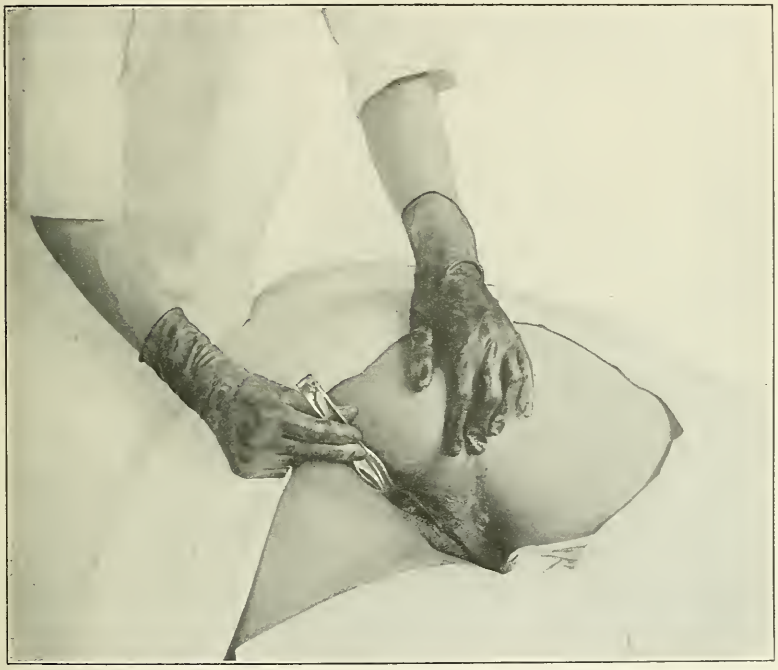
Front view of Sims' position.

the finger in the vagina, the uterus may be palpated over the entire surface of its body, and at the same time the vaginal and supravaginal surface of the cervix may be outlined by the finger in the vagina. In anteversion of the uterus the anterior surface of the uterine body is best palpated by the finger in the vagina, and the posterior surface by the external fingers. In retroversioflexion the posterior surface of the uterus is best palpated by the finger in the vagina and the anterior surface by the external fingers. When the uterine body is enlarged it

may be readily outlined in the combined examination without elevating the uterus by pressure from below.

Under favorable conditions it is possible to determine the position of the uterus, its size, form, sensitiveness, consistency, and mobility. No manipulating should be done until the position of the uterus is determined, and this is largely accomplished by vaginal touch. Pressure by the examining fingers may correct or exaggerate a malposition of the uterus. A preliminary vaginal examination will serve to eliminate such errors. For details of the method of examination in displacements of the uterus see Chapter XVI.

FIG. 34

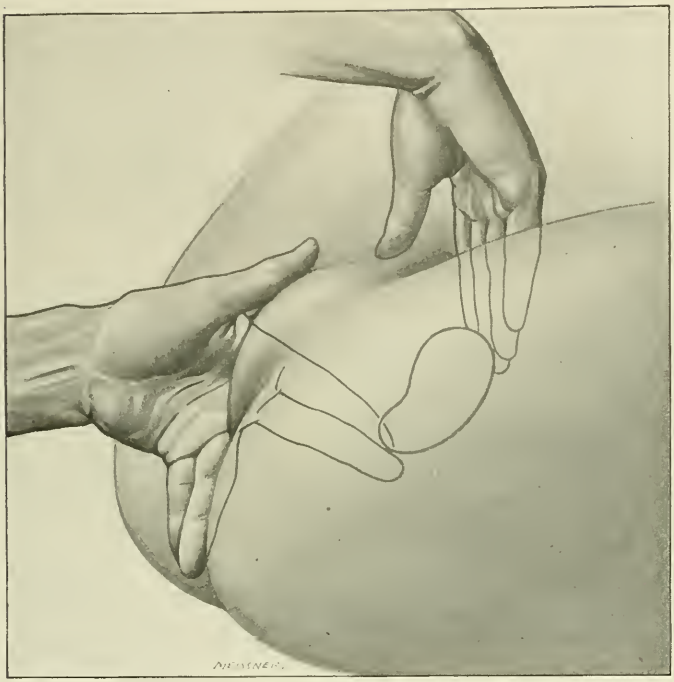


Sims' position. Perineum retracted by an assistant.

Only under unusually favorable conditions can a normal tube be outlined in a bimanual examination. If the abdominal walls are thick and tense an anesthetic will be required.

The uterus is first located by the abdominovaginal examination. From the horn of the uterus the hand, passing outward toward the sides of the pelvis, should follow the tube a variable distance. The normal tube is made to roll under the examining finger like a cord. It appears to be about the size of a slate-pencil. At the fimbriated extremity the wall is so thin that it is impossible, under normal conditions, to palpate it. When the uterus is in retroposition, or when

FIG. 35



Abdominovaginal examination.

FIG. 36

Proper attitude of the hand in making a vaginal examination with two fingers.

the tubes have fallen behind the uterus, or when the uterus and tubes are in their normal position and the vagina is small and sensitive, the recto-abdominal method of examination is preferable. In the unmarried, with the hymen intact, a recto-abdominal examination should be made.

When the tubes lie beyond easy reach of the examining finger, traction upon the cervix with vulsella forceps should be made by an assistant, while the recto-abdominal or vagino-abdominal method is carried out.

Can a sound be passed into the tubes? Undoubtedly the sound has been passed into diseased tubes, but it is questionable whether the normal tube has ever been sounded. It is certain that the procedure should never be attempted for fear of penetrating the uterus

The normal ovaries are palpated with difficulty, and are recognized by their position, size, form, and sensitiveness. The ovarian ligament is seldom felt.

In seeking the ovary, the bladder and rectum should be empty, and all constricting clothing removed from the waist. An anesthetic is not always required, but is helpful in all cases and indispensable in many. The patient is placed in the lithotomy position. The abdominovaginal method is usually chosen. If the vagina is short, resisting, or sensitive to pressure, or if the hymen is intact, it will be advisable to make a recto-abdominal examination. When the ovary lies behind the uterus it may be better palpated through the rectum.

As a matter of routine, it is advisable first to locate the uterus, then to follow from the horn of the uterus along the course of the tube to the ovary. The right ovary is best detected by the fingers of the right hand and the left ovary by the fingers of the left hand. It is not, as a rule, necessary to change hands; either the right or the left hand will suffice in most cases for the examination of both ovaries.

The pelvic peritoneum and cellular tissue should be explored as far as possible to discover undue sensitiveness, cicatricial contractions, inflammatory exudates, tumor formations, and collections of blood.

The rectum on its anterior wall may be explored through the vagina and something learned of its sensitiveness, of inflammatory infiltrations, foreign growths, and fistulous openings, but the rectovaginal method of examination is more satisfactory.

The base of the bladder and ureters may be palpated through the anterior vaginal wall. Tumors, calculi, inflammatory infiltrations, new-growths, and tenderness, from whatever cause, can be determined with some degree of satisfaction.

A rough estimate of the capacity and deformity of the bony pelvis can be made by the combined method.

The *abdominovaginal examination* is of greatest service in the differential diagnosis of pelvic tumors. By the combined method their size, form, consistency, rate of growth, mobility, and relation to other structures are determined. When the tumor is large and in the abdominal cavity the method of Schultze may be employed with

advantage. In addition to the customary bimanual examination an assistant draws the abdominal tumor upward while traction is made upon the cervix with a vulsellum forceps. (See Plate VII.)

The tumor may so closely press upon the uterus or be so closely adherent to it that a line of distinction between the two cannot be recognized by the examining finger. The variations in consistency and form, together with the use of the uterine sound, may determine the relations. Swellings of the tubes and ovaries when small can be differentiated from the uterus; but later, as they increase in size and become displaced behind or to the side of the uterus, they are recognized with difficulty. Likewise, pelvic exudates may blend intimately with the uterus. Frequently bodies which are apparently immovable in one position may be movable in another.

Examination under narcosis has many advantages. Kelly lays down the following rules for the use of anesthesia in the diagnosis of diseases of women:

1. When doubt exists after the ordinary bimanual examination.
2. When a patient comes to a specialist after having had treatment for a long time at other hands without improvement.
3. In all cases of pelvic peritonitis involving one or both ovaries or tubes without producing any gross tumor, the anesthetic will aid much in determining the extent of the disease.
4. Always in unmarried women.

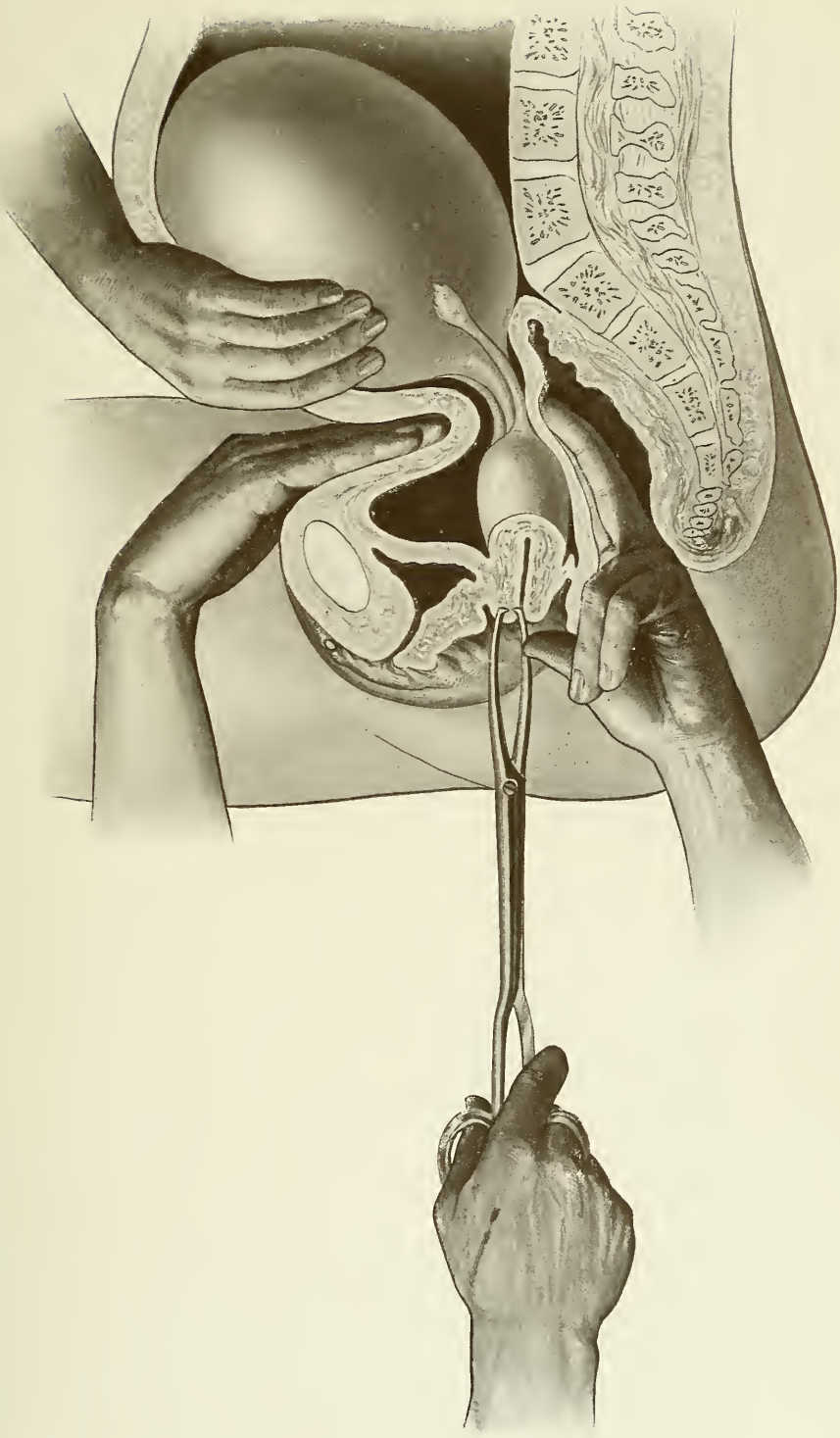
Nitrous oxide will serve admirably in the majority of cases. When the examination must be prolonged, as in the use of the cystoscope or curet, either chloroform or ether is often necessary.

It should be a rule, to which there are no exceptions, that after the patient is asleep and before the operation is begun a thorough bimanual examination should be made.

Under anesthesia a higher point may be reached by *invaginating the pelvic floor*. This is accomplished by making firm pressure upon the vulva and perineum with the examining hand. In so doing a gain of one to two and a half inches may be made. Additional pressure may be made by supporting the elbow of the examining arm against the hip and throwing the weight of the body against the arm.

Palpation of the Ureters through the Vagina.—When the abdominal walls are relaxed and thin and when there is relaxation of the vaginal walls it may be possible to palpate a thickened ureter for about two inches upward from the base of the bladder. The landmark for the pelvic portion of the ureter is at the brim of the pelvis, at a point just outside the sacro-iliac joint and internal iliac artery. When there is a suspicion of tuberculosis of the urogenital tract an effort should always be made to palpate the ureter.

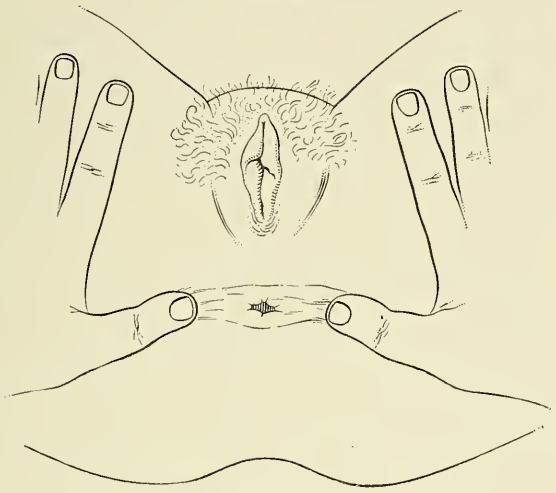
Digital Examination of the Rectum.—In point of efficiency, digital examination of the rectum and, through the rectum, of the pelvic structures ranks next to the vaginal method, and in some conditions is to be preferred. In all difficult and obscure vaginal examinations a rectal or rectovaginal examination should be made.



Palpation of the Pedicle of an Ovarian Cyst.

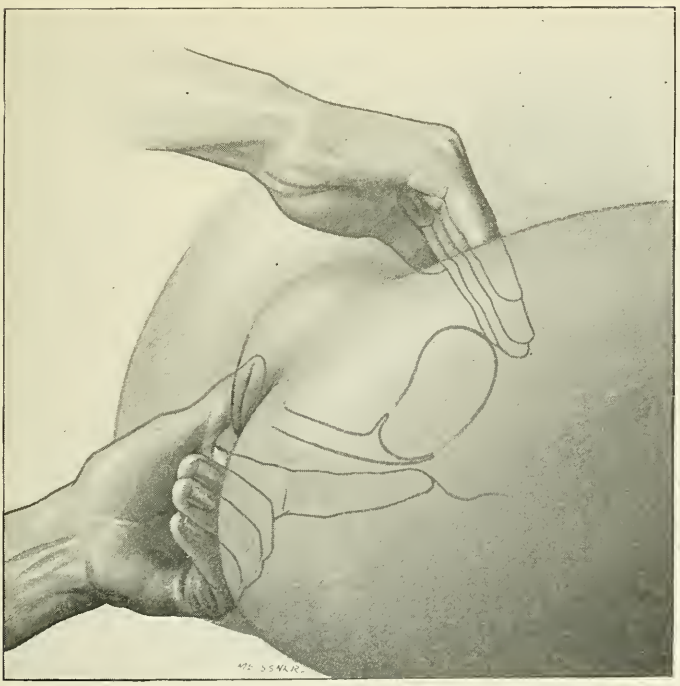
Two fingers are inserted into the rectum and the opposite hand over the abdomen. An assistant makes traction upon the cervix with a vulsella forceps while a third assistant grasps the cyst with both hands and draws it upward. In this manner the pedicle is put upon the stretch and can be engaged between the fingers in the rectum and those on the abdomen.

FIG. 37



Inspection of the anus.

FIG. 38



Abdominorectal examination.

The Simple Rectal Touch.—When for any reason a digital examination of the vagina cannot or should not be made, the internal genital organs must be examined per rectum. This method is most useful in congenital or acquired absence of the vagina, a narrow, shallow vagina, inversion of the uterus, vaginismus, and in virgins with an intact hymen. A rectal examination is of special advantage, not only when the vaginal examination is precluded, but in all lesions in the rectovaginal space.

The position of the patient should be the lithotomy, knee-elbow, or the Sims. In passing the finger into the rectum the tonicity of the sphincter is noted. Fissures, polyps, hemorrhoids, and new-formations are detected. Through the anterior wall of the rectum are felt the posterior vaginal wall, the cervix, and part or all of the posterior surface of the uterus, the base of the broad ligaments, frequently the tubes and ovaries when enlarged and prolapsed, and the uterosacral

FIG. 39

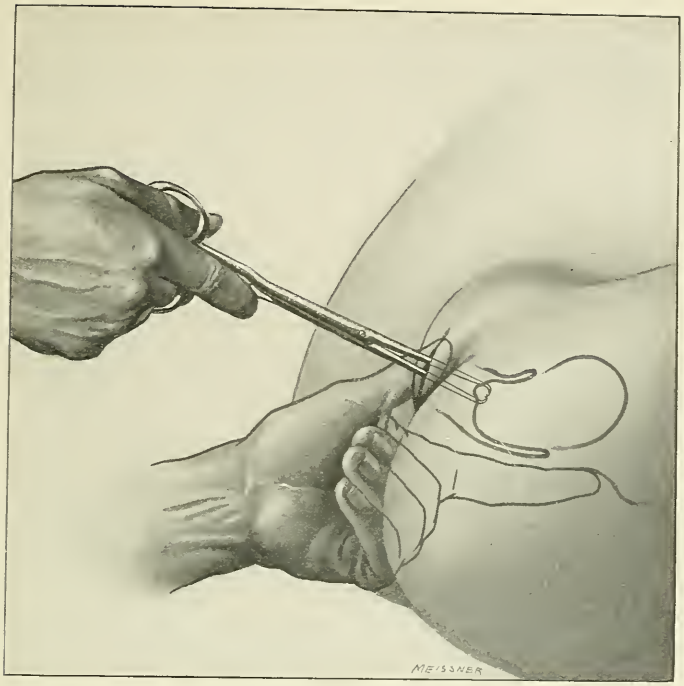
Digital examination of the rectum.

ligaments. Through the posterior wall of the rectum are felt the sacrum and coccyx. Because of the thinner and more distensible bowel wall, the structures occupying the posterior segment of the uterus are more easily reached through the rectum than through the posterior vaginal vault. The cervix projecting backward is not to be mistaken for the body of the uterus.

Abdominorectal Examination (Bimanual).—This method is carried out in general as is the abdominovaginal examination. In virgins with an intact hymen it is the method of choice. All conditions recognized by a simple rectal examination are more clearly palpated by the combined method.

The examination may be embarrassed by coils of intestine wedged into the cul-de-sac of Douglas. When such difficulties exist and the bowels are not adherent, they may be displaced by placing the patient

Fig. 40



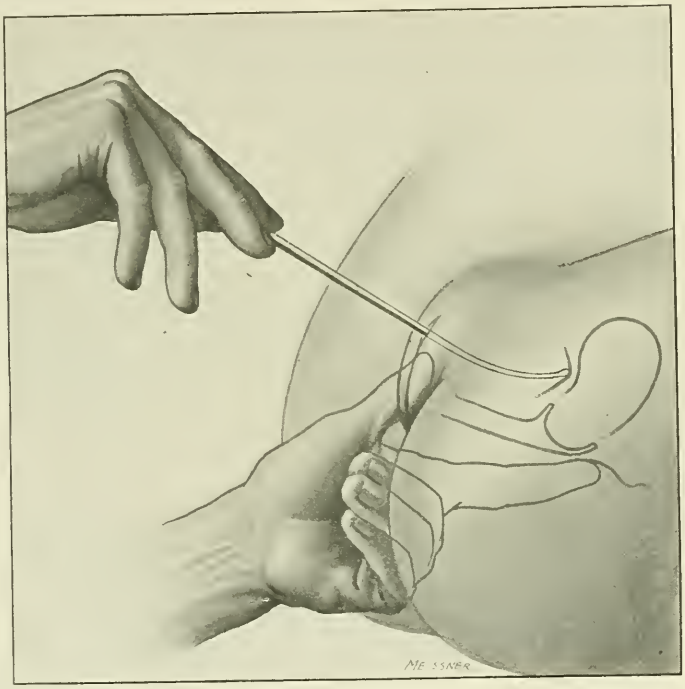
Rectal examination with traction upon the cervix by a vulsellum forceps.

Fig. 41

Abdominovaginorectal examination. The right hand depresses the abdomen, the thumb of the left hand is inserted into the vagina, and the index finger into the rectum.

in the knee-chest position. A Sims speculum is inserted into the bowel, allowing the air to rush in and balloon the rectum, when the bowel will fall forward out of the cul-de-sac. The patient is then placed in the dorsal position and the examination continued.

Fig. 42



Vesicorectal examination. A sound is passed into the bladder and the index finger into the rectum. In this manner the presence or absence of the uterus is determined.

Traction upon the Uterus in the Abdominorectal Examination by a vulsellum forceps will greatly facilitate the examination when the uterus lies either too far forward or too high to be readily reached by the finger in the rectum. At the same time pressure may be made from above downward and backward upon the uterus. The vulsellum forceps are held by an assistant while the operator makes the examination. No great amount of force should be applied to the uterus for fear of tearing adhesions.

Abdominovaginorectal Examinations.—This is a most serviceable method of examination. While effective, it is unpleasant to patient and physician. The finger should never be withdrawn from the vagina and inserted into the rectum without cleansing.

Digital examination of the bladder, either simple or combined with vaginal and abdominal methods (abdominovesical, abdominovesico-

vaginal), will not be considered. These methods have been replaced by others that are more efficient and less objectionable.

Pelvimetry.—It is seldom that pelvic measurements are taken of a gynecological case. This is but an evidence of the illogical separation of obstetrics and gynecology. Not a few of the pelvic lesions are the result of deformities of the bony pelvis. For a detailed description of the deformities of the pelvis and their measurements, the reader should refer to text-books on obstetrics. For practical purposes the measurements between the anterior superior spines of the ilium, between the trochanters, between the widest points in the crest of the ilium, and Baudelocque's diameters are all that are required.

CHAPTER VII

INSTRUMENTAL EXAMINATION

Vaginal Speculum
Vulsellum Forceps
Uterine Dilators
Uterine Sound
- Preliminary Procedures
- Indications
- Contraindications
- Dangers

Uterine Curet
- Indications
- Contraindications
- Dangers
- Technic
- In Treatment

Exploratory Punctures and Incisions

Vaginal Speculum.—For direct inspection of the vagina the speculum is used both in diagnosis and treatment. For diagnostic purposes it has a limited field of usefulness; digital exploration will alone serve the purpose in a large proportion of cases.

The lithotomy position is the one of choice. The rectum and bladder must be emptied. Before introducing the speculum a digital examination of the vagina should be made to locate the cervix for the purpose of knowing the proper direction in which to introduce the speculum in exposing the cervix.

The varieties of specula in common use are the Sims, Simons, bivalve, and tubular.

Sims' speculum is used with best advantage in the lateral position of Sims. The vaginal outlet is spread open by the thumb and index finger of the left hand, while the right hand introduces the speculum. The blade is passed between the fingers spreading the vulva, and is allowed to glide over the perineum into the vault of the vagina. With the placing of the speculum the air rushes into the vagina and balloons it. In this manner a direct inspection of the vaginal mucosa is made possible. Firm and steady traction is made backward upon the perineum in exposing the cervix. The Sims speculum was originally used in the knee-elbow position, but is now almost invariably used in the Sims or left lateral posture.

When the vagina is deep and the walls relaxed, in addition to the speculum, it is essential to use some sort of a depressor with which to expose the cervix by holding the walls of the vagina apart.

When the cervix is directed backward and is not readily exposed to view it may be hooked by a tenaculum and drawn forward. Such manipulations must only be carried out under the guidance of the eye or finger, for fear of hooking the vaginal wall instead of the cervix.

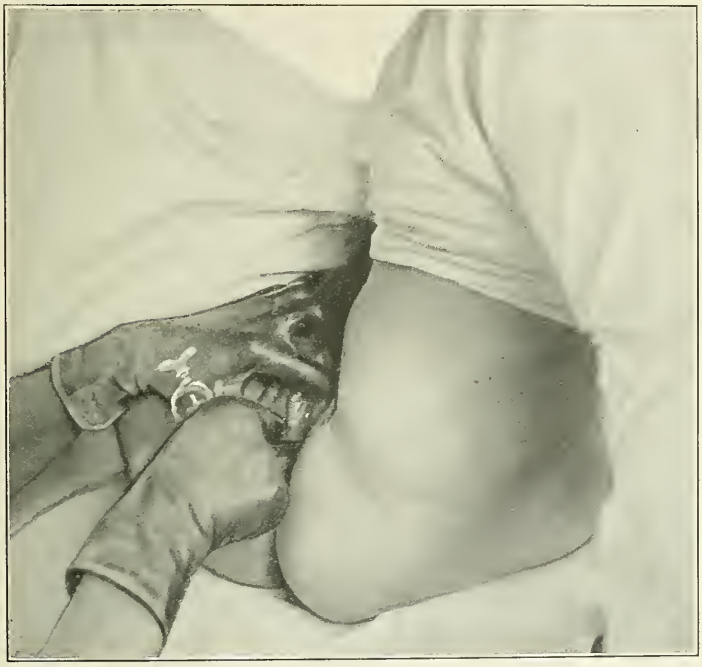
Simon's speculum is a device not unlike that of Sims', having a single spoon instead of two. It has an advantage over Sims' speculum in that there is no second handle to interfere with the manipulation of the instrument.

A combination of spoons of various shapes and sizes adjusted to separate handles has been devised by Bozeman and others.

For the purpose of exposing the cervix the lateral walls of the vagina may require retraction.

The bivalve speculum is in general use, though inferior in every respect to the Sims and Simons. Cusco's lateral modification is simple and easily manipulated. The instrument consists of two blades, taking the form of a beak. The articulated outer end is manipulated by a screw which spreads the valves to an acute angle. It is closed and inserted by its smaller diameter, and when inserted the instrument is

FIG. 43



Insertion of the bivalve speculum. Labia held apart by the fingers of the left hand.

turned so that the screw points toward the perineum. As the blades are separated they distend the vagina, and the cervix engages between the blades. The great objection to this instrument is that the anterior and posterior walls of the vagina are obscured by the blades, and the traction upon the vaginal walls separates the lips of the cervix to an unnatural degree. The one great advantage is the fact that it is a self-retaining speculum, requiring no assistant to hold it.

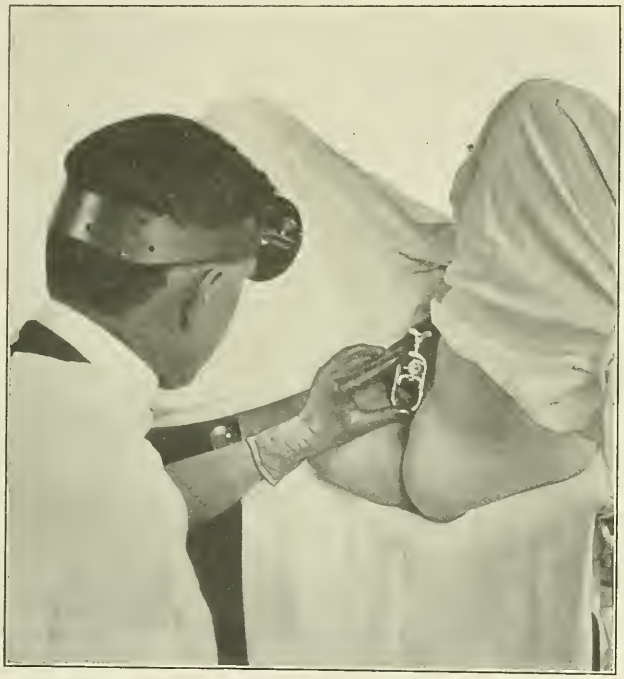
In withdrawing the instrument care must be exercised for fear of catching folds of the mucous membrane; the instrument must be withdrawn slowly and the screw gradually loosened as the speculum is retracted.

The tubular speculum is seldom used. It is made of metal, wood, celluloid, glass, or vulcanite, and may be introduced in the lithotomy, knee-chest, or Sims' position. It can only expose the cervix, and this is done with difficulty.

The self-retaining speculum, composed of a spoon-like blade and a weighted handle, will be found of the greatest service in making an exploratory curettage and in excising pieces from the cervix.

Currier's weighted self-retaining speculum with two adjustable blades is an admirable device.

Fig. 44



Inspection of the cervix by artificial light (through a bivalve speculum.)

Too much emphasis cannot be placed upon the necessity for surgical cleanliness in the use of vaginal specula.

Some operators who scrupulously sterilize all instruments to be introduced into the uterus carelessly use a speculum after little or no cleansing. Gonorrheal infection may be transmitted in this manner.

To fail to sterilize the vaginal speculum before using is criminal negligence.

Vulsellum Forceps.—Traction upon the cervix is made with the vulsellum forceps. When the uterus and its attachments are in a normal position the cervix can be drawn almost to the vulvar outlet. Little or no pain is caused by the grasp of the forceps upon the cervix.

A vaginal speculum need not necessarily be used in grasping the cervix with the vulsellum forceps; the finger may be used as a guide, but this procedure demands great caution and experience.

As an aid to diagnosis the vulsellum forceps is used to make traction upon the uterus, bringing it and adjoining structures within easier reach of the examining finger in the vagina or rectum.

In determining the relation of large tumors and swellings to the uterus, it is of advantage to steady the uterus by making traction downward upon the cervix. The forceps is held by an assistant while the examiner manipulates the tumor. If tumor and uterus move together there must be an intimate connection between the two.

In differentiating an erosion from an eversion of the cervix the two lips of the cervix are grasped by the vulsellum forceps and the lacerated edges approximated. If the red surface disappears an eversion is diagnosticated; if there still remains a red zone about the external os an erosion must be present.

In removing sections from the cervix for diagnostic purposes the cervix is grasped by the vulsellum forceps.

Forcible traction upon the cervix is not without danger. It is possible to rupture the peritoneum and to tear through adhesions. Acute inflammatory lesions of the pelvis are absolute contraindications to the use of the vulsellum forceps lest the inflammation be excited to further extension. In the pregnant uterus severe hemorrhage may be brought on by the application of the forceps.

In removing the vulsellum forceps care must be exercised for fear of injuring the cervix or wounding the patient. Superficial sutures of catgut or a vaginal pack of iodoform gauze may be placed if hemorrhage is severe.

Uterine Dilators.—For the purpose of exploring the uterine cavity with the finger and curet the cervix must be dilated. Hegar's or Kelly's dilators are recommended for general use. By them the cervix is symmetrically dilated, with a minimum amount of trauma.

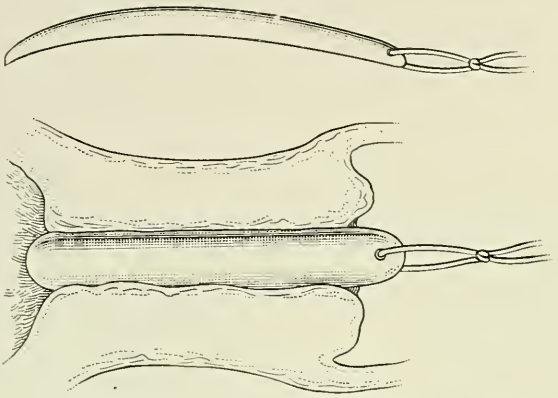
The vaginal speculum should always be used to expose the cervix. The anterior lip of the cervix is grasped by a vulsellum forceps. The dilators are sterilized by boiling, and lubricated with sterilized glycerin or boroglycerin. Beginning with a size that can easily be passed through the cervical canal, one after another of the sounds is passed until the cervix will admit the index finger.

The utmost care must be exercised in passing the dilators for fear of losing control of the instrument and accidentally forcing it through the uterine wall. To eliminate this danger the depth and direction of the uterus should first be ascertained by the sound. The dilators are then grasped by the thumb and index finger at a point about one inch short of the length of the uterus.

Instruments of divulsion, such as Palmer's, Goodell's, and Ellinger's, are commonly used in America. Only moderate force should be applied in dilating with these instruments for fear of tearing the cervix. They do not find favor in Europe because of this frequent accident.

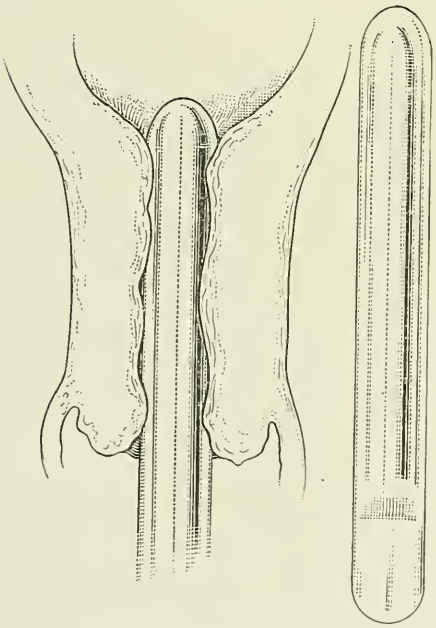
Tents are now seldom used. They are not only slow and uncertain in their action, but are a source of danger from infection. They are made of sea-tangle, sponge, and tupelo.

Fig. 45



Laminaria tent. Dilatation of the cervix with a laminaria tent.

Fig. 46



Cervix dilated with a Hegar bougie

Uterine Sound.—Aetius speaks of using the sound to measure the length of the vagina. Sir James Y. Simpson introduced the modern sound as a material aid in the diagnosis of lesions involving the uterus.

Simpson does not deny that the sound was used for exploration and measurements of the uterus long before his time. Certain it is that Wierus used the sound for like purposes as early as 1637. Beginning with the indorsement of Simpson and up to the present time, the sound has been used too freely and not without harm. Since the bimanual method of examination has been largely practised, the use of the sound has been materially restricted. It is seldom necessary to pass the sound in the consultation room. The bimanual examination will usually suffice.

FIG. 47

Simpson's graduated sound.

In the construction of a uterine sound there are certain requirements. This instrument should be made of a flexible metal, preferably of copper, and nickel plated; the distal end should be rounded and knob-like; the handle should be flat and grooved on one side only. Beginning two and one-half inches from the distal end the sound should be graduated every half-inch for the purpose of measuring the depth of the uterine cavity.

Preliminary Procedures.—Before the sound is passed certain precautionary measures are necessary. First, there must be surgical cleanliness in the preparation of the field of operation, the instruments, and the hands of the operator. Second, a bimanual examination should be made to determine, if possible, the position of the uterus. By adhering to these preliminary precautions the dangers of infection and perforation are minimized. The most convenient position is the lithotomy, though it is possible to introduce the sound with the patient in the lateral or knee-chest position.

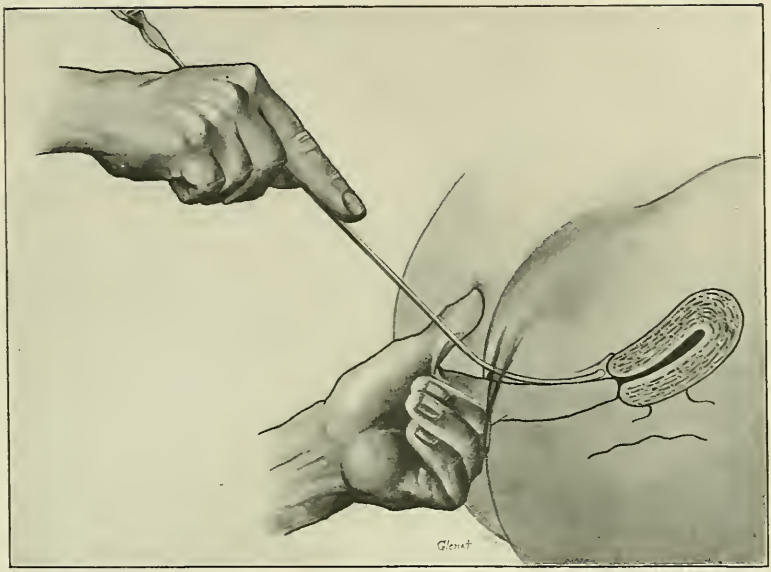
Indications for the Use. — *Estimating the Depth of the Uterine Cavity.*—The depth of the uterine cavity is accurately measured by the sound. Its average normal depth is two and a half inches in a nullipara of mature years, and this is increased about one-half inch in the multipara.

(*a*) The depth of the uterine cavity is lessened in acquired and congenital atrophy, atresia of the uterus, inversion of the fundus, and in new-formations encroaching upon the cavity of the uterus.

(*b*) The depth of the uterine cavity is increased in pregnancy, subinvolution, elongation of the cervix, endometritis, metritis, and newgrowths of the uterus.

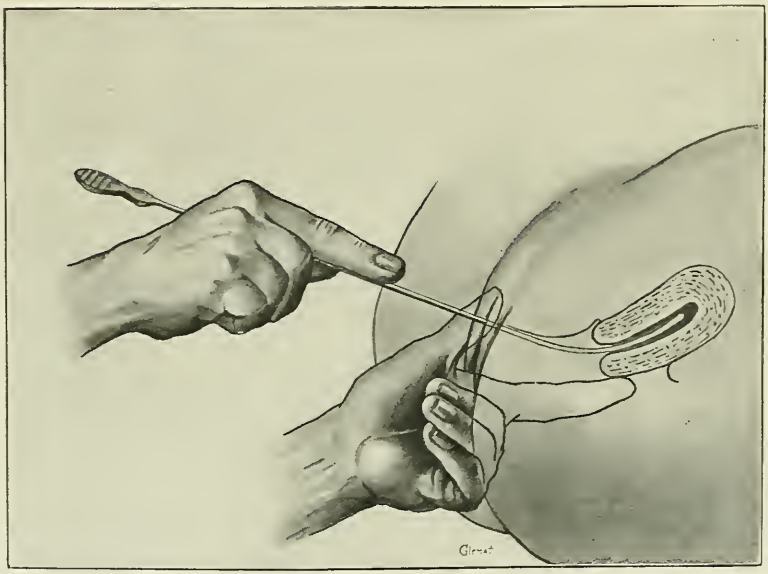
The Direction of the Uterine Canal.—This is often changed from the normal by newgrowths in and about the uterus, by senile involution, by inflammatory contraction, and by displacements of the uterus from whatever cause. As stated above, it is always wise to precede the

FIG. 48



First step. The sound is guided to the external os along the palmar surface of the index finger or the speculum is used. The patient is in the dorsal position.

FIG. 49



Second step. The sound is passed slowly into the uterine cavity. The direction taken by the sound is carefully noted. The patient is in the dorsal position.

passage of the sound by a preliminary bimanual examination. If the relation of the body to the cervix is determined, the sound is curved at the proper angle before it is introduced. By so doing there is less danger of puncturing the uterus.

Stenosis and Atresia of the Uterine Canal.—These lesions can be definitely determined by the sound. Apparent stenosis at the point of flexion is often made to disappear by traction upon the cervix with vulsellum forceps.

Irregularities of the Mucosa.—If not too small and soft, they may be detected by the sound. Such irregularities are submucous fibroids, polyps, malignant growths, and retained placental tissue. When possible it is always preferable to use the finger rather than the sound.

The Thickness of the Uterine Wall.—By passing the sound into the uterus and having one hand over the abdomen and the fingers of the other hand in the rectum, it is possible, under favorable conditions, to make a fair estimate of the thickness of the uterine wall.

Contra-indications to the Use of the Sound.—*Menstruation.*—Though not an absolute contra-indication, it is better to delay the procedure until the intermenstrual period.

Pregnancy.—Pregnancy is an absolute contraindication to the passage of the sound. While the sound has been passed into a gravid uterus without interrupting pregnancy, it is never justifiable to pass the sound when there is a possibility of pregnancy.

Malignant Growths.—Malignant growths, while not an absolute contraindication, are to be regarded as a source of danger and demand very cautious use of the sound for fear of exciting hemorrhage and perforating the uterus.

Acute Pelvic Inflammation.—Acute pelvic inflammation is a contraindication to the use of the sound as well as to all manipulations of the pelvic viscera.

Dangers.—*Infection of the Uterus.*—This may be caused either by an unclean instrument or by carrying the infection from the lower genital tract. Forcible and careless manipulations injure the delicate mucosa, thereby producing an atrium for infection. Because of the danger of infection the custom of passing the sound in the routine office practice is condemned.

Perforation of the Uterus.—This accident may happen to the most cautious operator. The uterine wall may be so soft as to offer no perceptible resistance to the passage of the sound into the peritoneal cavity. Such softening may be due to infection, malignant infiltration, or pregnancy.

Hemorrhage.—Hemorrhage may be alarming in the case of malignant growths of the uterus, hydatid mole, and incomplete abortion.

Pelvic Inflammation.—Pelvic inflammation may be occasioned by the passage of a sound into the uterus. This is seldom the case in the absence of a preëxisting infection.

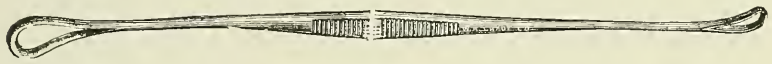
It is a dangerous practice to test the mobility of the uterus by means

of the sound. The bimanual examination, with or without anesthesia, should afford all needed information, and with far less risk.

Uterine Curet.—The fact that the uterine curet is universally used speaks for its utility; but, as with many of the great and useful things of life, it is also capable of harm in the hands of the incompetent.

The use and abuse of the uterine curet is a subject that should engage the careful consideration of the general practitioner far more than many of the more pretentious problems in the treatment of diseases of women, because the curet is the most used and the most abused instrument in the armamentarium of the gynecologist, and, the author might add, of the general practitioner as well.

FIG. 50



Blake's curet

FIG. 51

Boldt's double curet.

Indications.—The indications for the use of the uterine curet in the diagnosis of the diseases of women are as follows:

The uterine curet in diagnosis may be used in any of the lesions within the uterine cavity and involving the endometrium.

Endometritis. First in order of clinical importance and frequency is endometritis. An excessive menstrual flow and a so-called leucorrheal discharge from the uterus, together with a history of infection, generally suffice for a clinical diagnosis of endometritis; but a positive diagnosis—one that amounts to a scientific certainty—can only be made by a microscopic examination of scrapings removed by the curet. All of the clinical signs of endometritis may be present without inflammatory changes in the endometrium, and, on the other hand, endometritis may be present to a marked degree in the absence of any clinical evidence. It is never justifiable to curet the uterus for the purpose of differentiating between the various anatomical forms of endometritis, but rather to determine the fact of endometritis and to exclude other possible lesions, such as retained placental tissue and carcinoma. It is a matter of little concern whether the lesion is a hypertrophic or a hyperplastic, a fungous or a polypoid endometritis. It is the possibility of the presence of endometritis and not the question of the particular anatomical variety that is of practical clinical importance.

Retained Products of Conception.—These may remain attached to the uterus for years, giving rise to hemorrhage and leucorrhea, the cause of which can only be demonstrated by exploring the uterine cavity. In all such cases the finger, if possible, should be used in

locating and removing the retained fetal tissue. Shortly after abortion and labor, curetting is rarely justifiable because of the dangers involved. The author's preference is for the Emmet curet forceps as a substitute for the usual form of curet.

Fig. 52

Emmet curet-forceps.

Submucous Fibroid.—The firm, rounded bulging of a submucous fibroid is sometimes demonstrated by means of the curet.

Malignant Growths.—Malignant growths of the endometrium can only be diagnosticated in the early stage by microscopic examinations of scrapings. There may be no symptoms, or merely those common to endometritis, and this is even possible in cases far advanced. In the author's experience the systematic examination of uterine scrapings has frequently brought to light an unsuspected malignant growth, and that which has passed clinically for malignancy has been demonstrated to be endometritis or retained placental tissue.

Syncytioma malignum—*i. e.*, a malignant degeneration of placental tissue—is a rare finding, but because of its rapid spread and fatal issue an early diagnosis is imperative. When an unaccountable hemorrhage from the uterus occurs weeks or months after labor or abortion, and particularly after the expulsion of a hydatid mole, an exploratory curettage is demanded, and a microscopic examination should be made in view of the possible finding of malignant changes in the placental remains.

There is no more important and certainly no more satisfactory procedure in all the range of diagnosis than the differential diagnosis of uterine scrapings. A sharp line cannot always be drawn between the benign and the malignant, but in the hands of a competent observer such failures are unusual.

In the diagnosis of *ectopic pregnancy* it is sometimes advisable to curet the uterus to determine the presence of decidual tissue. Great caution must be exercised for fear of rupturing the gestation sac.

Contra-indications.—*Menstruation.*—Menstruation is not an absolute contra-indication, but it is seldom that the procedure cannot be delayed until the menstrual period is passed.

Pregnancy.—The possibility of pregnancy must be positively excluded. When doubt exists after a thorough examination it is always well to await developments for a month or more. A good rule to follow is to never use the curet in cases of delayed menstruation when pregnancy is at all possible.

Acute and Subacute Pelvic Inflammations.—These are contraindications because of the danger of extending the infection. It is always wise to wait until the pelvic inflammation has subsided before curetting. Distended tubes and ovaries are liable to rupture. No harm is likely to result if the contained matter is serum, but if pus escapes the consequences may be disastrous.

Dangers.—The dangers involved in curettage are by no means trivial. The curet is a formidable instrument, and curettage is not to be regarded as a minor operation and without attending dangers.

Septic Infections.—As with all operations, there is the risk of septic infection through a wounded surface. The likelihood of infection is not great when the uterus is firmly contracted; but in the puerperal uterus, with large venous sinuses and possible infection already existing therein, all the conditions are present which favor a wound infection.

Hemorrhage.—Hemorrhage is an unlooked-for complication, yet in puerperal and malignant cases the loss of blood may be alarming and fatal.

Inflammatory Exacerbations.—The danger of exciting an acute exacerbation of a preëxisting pelvic inflammation is always imminent.

Perforation.—Perforation of the uterus by the curet is an accident that may happen to the most skilled and cautious surgeon. The author ventures the assertion that not an operator of large experience has escaped this misfortune. The statements frequently made that the perforation is of little consequence are not substantiated. In a puerperal infected uterus the uterine wall may offer no more resistance to the curet than would blotting paper; the instrument passes through the wall, apparently meeting no resistance. In dealing with a puerperal uterus the only safeguard lies in discarding the curet, both the dull and the sharp. The fingers, placental forceps, and douche are all sufficient, save in very exceptional cases. Not only is the finger less likely to perforate the uterus, but by the finger the placental site is located and the adherent placenta removed, leaving the remaining uterine surface intact, as it should be. Nature has thrown out a barrier in the decidua in the form of leucocytes or phagocytes, the so-called "protective zone," that will resist the invasion of microörganisms if it is possible for anything to do so. The curet would but tear away this protective wall and allow a direct invasion of the venous sinuses by the septic organisms.

Removal of Decidua.—The removal of the decidua down to the musculature is a possible danger when the curet is used. With the finger this accident will not occur. From the decidua the new endometrium is regenerated, and if completely scraped away there will be left in its place a permanent scar surface, rendering the woman sterile and a sufferer.

The same result, though to a lesser degree, may follow too vigorous scraping of the non-puerperal uterus. The grating of the instrument is a sign that the mucosa is removed down to the deeper and firmer layers, and it is time to stop lest the entire mucosa be removed.

Technic of Operation.—The following is an outline of the *technic of curettage:*

1. Anesthesia, preferably ether or nitrous oxide and oxigen.
2. Shaving and sterilization of the vulva and vagina.
3. Dilatation of the cervix with Hegar's bougies or an instrument of divulsion.

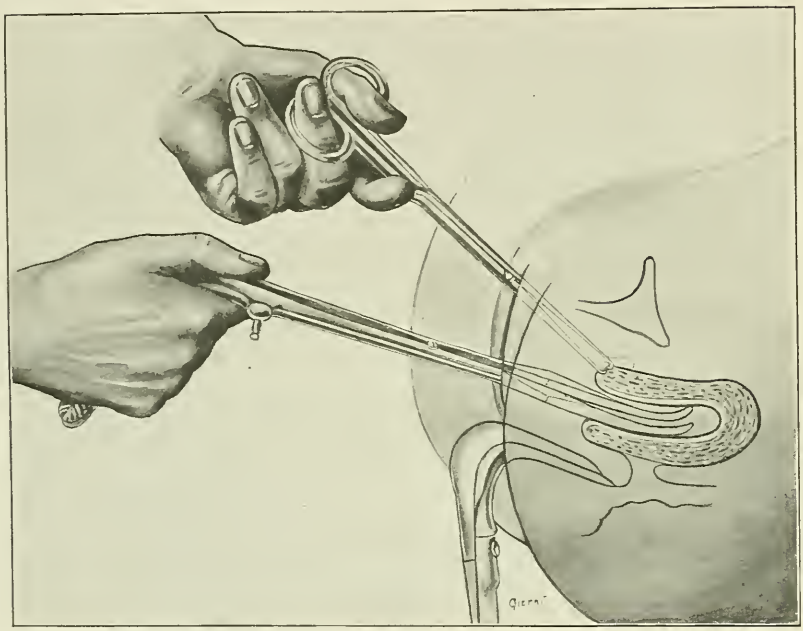
FIG. 53

Graduated bougies are used for the dilatation of the cervix. This method is preferable to that shown in Fig. 54.

4. Cautious introduction of a curet to one of the uterine horns and deliberately sweeping downward as far as the internal os. Passing by successive sweeps along the posterior wall to the opposite horn, then to the side and in front to the original point of attack, making sure that no furrows or patches are left by again going over the surface in a similar manner. All upward movements of the curet should be performed with caution for fear of perforating the uterus.
5. As a routine practice the author would recommend swabbing the uterus with full strength formalin.
6. No uterine pack is recommended unless the uterus is relaxed and bleeding freely. A sterile vaginal tampon should be inserted against the cervix for twenty-four hours, then removed, and 1 per cent. lysol douches or formalin (1 to 2000) should be given daily for a week.
7. Rest in bed should be enjoined for a period of four or more days.

8. No escharotics should be used. The sharp curet should be employed in all cases, with the exception of a puerperal uterus, which should never be scraped. (See Figs. 53 to 56.)

Fig. 54



Cervix is exposed by a self-retaining speculum and grasped at its anterior lip by a vulsellum forceps. Traction is made upon the cervix as it is dilated by an instrument of divulsion. Patient in dorsal position.

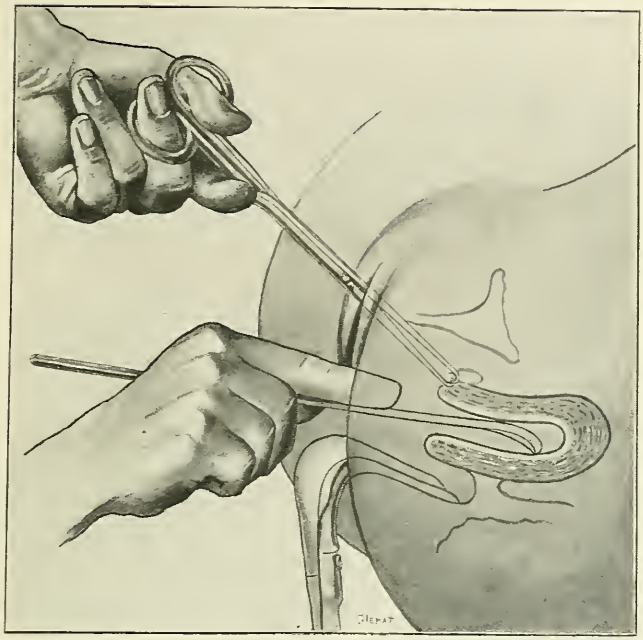
The Uterine Curet in Treatment.—There is no instrument so universally misused as the uterine curet. It has been applied for the relief of almost every pelvic disorder, because no accurate diagnosis was made. Pelvic pain, leucorrhea, uterine hemorrhage, backache, sterility, one and all, have been made the object for the indiscriminate use of the curet. The fact is, there is but a limited field of usefulness for the curet in the treatment of diseases of women.

Indications.—Following are the therapeutic indications:

Control of Uterine Hemorrhage.—Whatever the cause of uterine hemorrhage may be, whether it is due to endometritis, cancer, fibroids, muscular insufficiency of the uterus, polyps, sarcoma, syncytioma malignum, etc., the bleeding can usually be checked for a time at least by thoroughly scraping the uterus. The control of uterine hemorrhage is the one great therapeutic function of the curet.

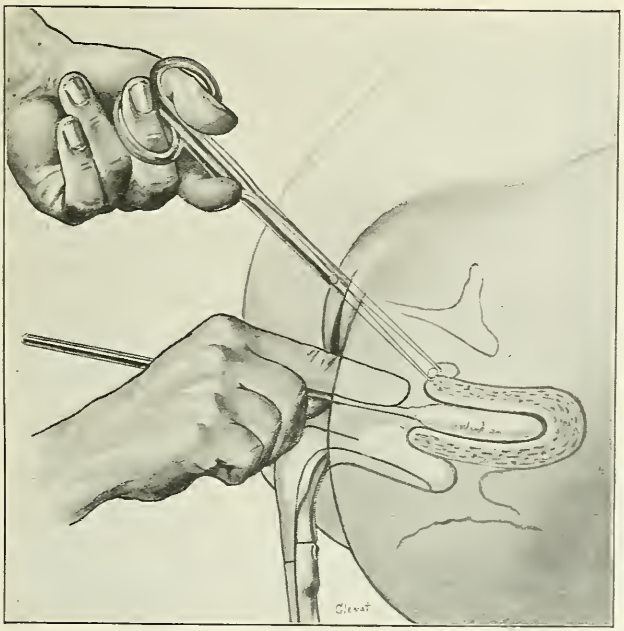
Leucorrhea.—When there is no infection of the uterus the leucorrheal discharges can be controlled in part by scraping the uterus, but the

Fig. 55



Curettage of the uterus.

Fig. 56



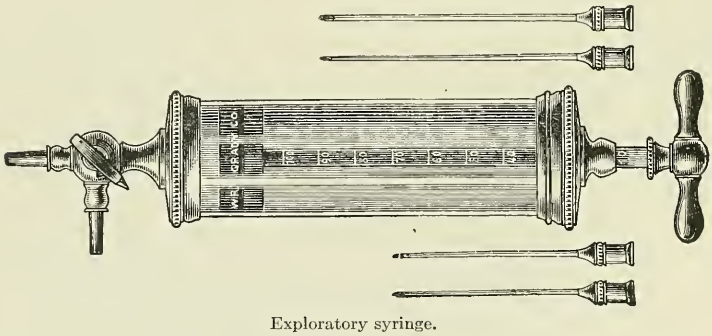
Curetted surface is swabbed with pure formalin.

opportunity will rarely arise for its use in this particular. *The uterus should never be curetted in the presence of a purulent discharge, because the scraping of an infected uterus leads to extension of the infection to the deeper structures in the uterine wall and to the tubes.* Because of the great importance of this dictum the author repeats, *Never curette an infected uterus!*

Inoperable Cancer of the Uterus.—When the disease has gone beyond hope of radical cure the hemorrhages and other discharges may be controlled for a time by scraping away all friable tissue.

Exploratory Punctures and Incisions.—An exploratory puncture is occasionally resorted to for the purpose of completing the diagnosis. When a conjoined examination fails to determine the nature of a pelvic tumor, aspiration is an essential aid to the diagnosis. Collections of blood, pus, and serum in the tubes, ovaries, and pelvic tissues often cannot be diagnosticated with certainty until the contents are procured either by aspiration or by incision. Furthermore, the character of the obtained fluid may not be recognized until submitted to a chemical, microscopic, and bacteriological examination. It is a growing conviction that an exploratory incision affords better results and is less dangerous than is aspiration. This is particularly true of abdominal explorations. It is a matter of common experience that pus and blood cannot always be withdrawn from the pelvis through an aspirating needle.

Fig. 57



Exploratory syringe.

The instrument and field of operation must be rendered perfectly sterile. When surgical principles are carried out no harm should follow either procedure. Exploratory incisions are of value not only in determining the character of the contained fluids in the pelvis, but the procedure has a much wider range of usefulness. *Indeed, it may be truly said that every abdominal incision is in a sense exploratory. The abdominal surgeon very often encounters unsuspected growths and adhesions, and, for this reason, one who is not master of any condition that may unexpectedly arise, should not undertake to open the abdominal cavity.*

CHAPTER VIII

MICROSCOPIC EXAMINATION OF SCRAPINGS AND EXCISED PARTS—DIAGNOSIS OF EXPELLED MEMBRANES FROM THE UTERUS

MICROSCOPIC EXAMINATION OF SCRAPINGS AND EXCISED PARTS

Removal of Uterine Tissue for Diagnostic Purposes
Test Excision from the Cervix
Test Curettage of the Uterus
Frozen Specimens of Excised Pieces and Scrapings
Fixing the Specimens
Hardening and Embedding
Method of Staining and Mounting Sections
Inspection of Uterus after Removal

The microscope is indispensable in the diagnosis of diseases of women. The microscopic examination of scrapings and excised pieces constitutes one of the most important and gratifying means of determining the character of lesions involving the cervix and endometrium.

Bimanual examination alone will determine many of the affections of the pelvic viscera; inspection of the vagina and vaginal portion of the cervix through a speculum will afford much information; direct palpation of the cervical canal and cavity of the uterus will add much knowledge of the extent and character of the lesions involving these surfaces; the clinical symptoms are important in the consideration, but a positive diagnosis, one that admits of no reasonable doubt, is often reserved until a microscopic examination of scrapings and excised pieces has been made.

Very often the microscope serves to verify a clinical diagnosis, but in not a few cases a previously unsuspected condition is brought to light by a microscopic examination of scrapings from the endometrium and excised pieces from the vaginal portion of the cervix.

The author does not claim that the microscope is an infallible means of making a diagnosis. These are cases in which the diagnosis remains in question after all means—the microscope included—have been exhausted.

When a clinical diagnosis of cancer is made the suspected tissue should not be scraped unless preparations are made for a radical operation. This rule should be enforced because of the danger of disseminating a cancerous growth by means of the curet.

Removal of Uterine Tissue for Diagnostic Purposes.—In all cases, unless contraindicated, a general anesthetic is advisable. Cocaine may be used as a local anesthetic in excising pieces from the cervix.

When the tissue is soft and friable, as in carcinoma, no local or general anesthetic may be required.

It is not necessary to shave the vulva, but by scrubbing and douching the field of operation is made clean.

The position assumed by the patient may be the Sims or lithotomy. If the former, the Sims or Simon speculum is used; if the latter, the Simon or self-retaining speculum is preferred. The self-retaining speculum is especially advantageous because no assistant is needed.

Test Excision from the Cervix.—After grasping the anterior lip of the cervix by the vulsellum forceps a small wedge is cut from the cervix by angular scissors. In selecting a portion for excision an effort should be made to include in the removed piece a part of the healthy together with the diseased tissue for the purpose of studying the transition stages.

Hemorrhage is controlled by a gauze pack, or, when necessary, by the placing of absorbable sutures.

Test Curettage of the Uterus.—The cervix is dilated sufficiently to admit a moderate-sized curet. The instrument is passed, under control of the eye, by the aid of a Sims or Simon speculum. The patient is in the Sims or lithotomy position. In order that no portion of the endometrium escape the curet, the uterus should be scraped systematically and thoroughly, beginning at one horn and sweeping deliberately down to the internal os, passing in this manner over the entire inner surface of the uterus, taking care that no portion of the endometrium be missed. Before the blood has time to coagulate firmly the scrapings are first washed in cold running water and then removed to a 4 per cent. solution of formalin. Allowing them to lie long in water causes maceration. All particles in the scrapings are to be carefully preserved, so that if necessary the entire specimen may be examined.

Frozen Specimens of Excised Pieces and Scrapings.—When an immediate diagnosis is required the freezing method may be employed with fairly satisfactory results. It occasionally happens that the examination of excised pieces and scrapings will determine the question of a more radical procedure. If for reason of expediency or added risk from a second anesthetic it becomes necessary to proceed without delay, frozen sections may be prepared and diagnosticated while the patient is being prepared for a radical operation. Not more than twenty minutes are required for the examination.

The following is the method employed in Johns Hopkins Hospital by Cullen:

(*a*) Place the frozen section in 5 per cent. aqueous solution of formalin for from three to five minutes.

(*b*) Leave in 50 per cent. alcohol one minute.

(*c*) In absolute alcohol one minute.

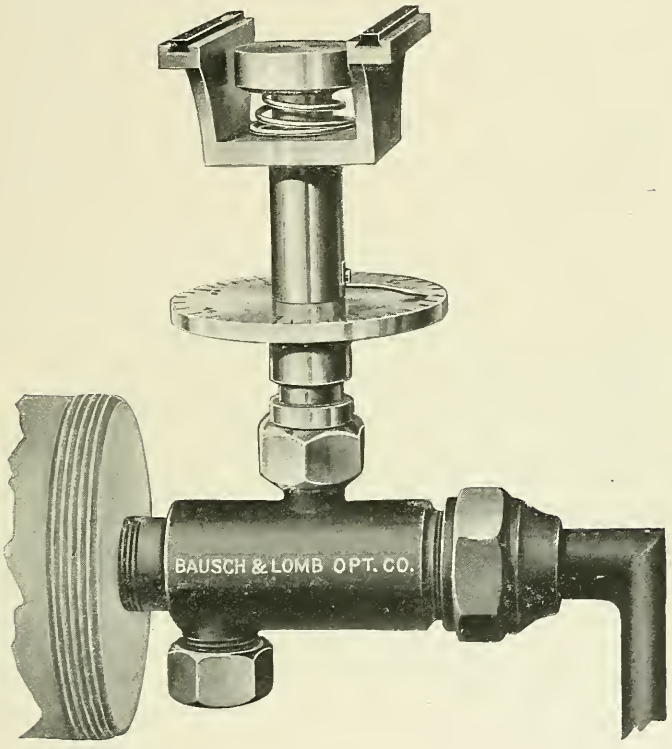
(*d*) Wash out in water.

(*e*) Stain in hematoxylin two minutes.

(*f*) Decolorize in acid alcohol.

(*g*) Rinse in water.
(*h*) Stain with eosin.
(*i*) Transfer to 95 per cent. alcohol.
(*j*) Pass through absolute alcohol, then through creosote or oil of cloves, and mount in Canada balsam.

FIG. 58

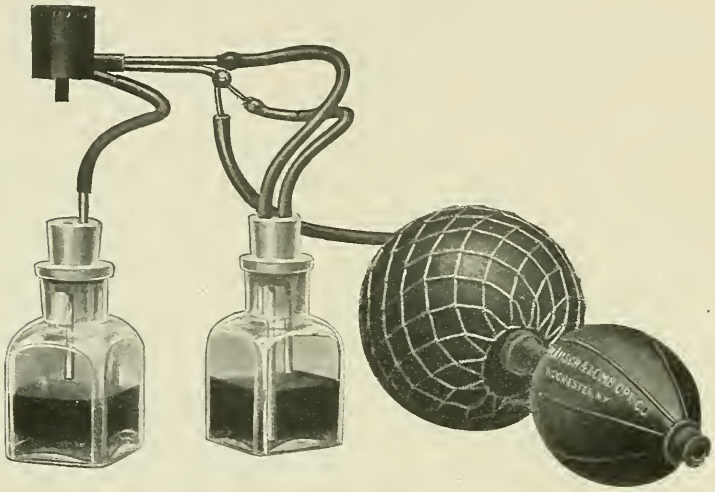


Bardeen CO_2 freezing microtome. This microtome is an improved pattern after designs by Professor C. R. Bardeen, of Johns Hopkins University, and is a most excellent instrument for regular pathological and other demonstrations. It is indispensable for clinical work when stained sections of morbid tissues are required within a few minutes of the beginning of an operation in order that the surgeon may determine his mode of procedure. It freezes almost instantaneously regardless of room, temperature, or humidity, and at very small expense. The temperature of the object to be frozen is, within limits, under the control of the operator. The freezing chamber contains a spiral passage through which the expanding CO_2 passes, securing the maximum freezing power. The knife slides on glass guides. The finest feed is twenty microns. The microtome may be attached directly to a CO_2 cylinder.

While the freezing method has an important place in connection with the operating room, the sections are not eminently satisfactory, for the reason that only small sections can be made and differentiating stains cannot be used. When an immediate diagnosis is not required (and this is true in the majority of instances) the celloidin or paraffin methods are preferred.

Fixing the Specimens.—Zenker's Fluid.—Zenker's fluid (Müller's fluid, 100 per cent.; bichloride, 5 per cent., and, shortly before using, the addition of 5 per cent. of glacial acetic acid) is an excellent fixing fluid, preserving the blood in its natural color. After fixing in Zenker's for twenty-four hours the section is placed in cold running water for twenty-four hours or in a weak iodine solution for a like time. The section is then ready for hardening in alcohol. No better fixing fluid can be used when time will permit. It is often well to place the entire uterus in Zenker's fluid for a week or more before cutting sections from it.

Fig. 59



Ether or rhigolene freezing attachment. This attachment consists of a cylindrical freezing stage upon which the object to be frozen is placed and against which a very fine spray of ether or rhigolene as desired is projected by a delicate atomizer operated by the bulb air-pump shown in the illustration. The rapid evaporation of the fluid abstracts sufficient heat from the object to freeze it in a short time. There is always, however, an excess of fluid which does not evaporate, and this is drained back into a bottle and used again. This freezer is applicable to the automatic laboratory, medium laboratory, student, table, aud demonstration microtomes.

Alcohol.—Alcohol as a fixing agent is objectionable because of the shrinkage of the tissues. When it is desired to examine for micro-organisms, alcohol is of special value.

Formalin.—Formalin may be used in a 2 to 4 per cent. solution. It is objected to because of the difficulty in cutting the musculature.

Hardening and Embedding.—When it is desired to prepare the section hurriedly, a small piece is placed immediately in absolute alcohol and changed three or four times in twenty-four to thirty-six hours, when it is ready for embedding.

When an additional day or two can be taken, better sections are made by running the pieces through successive strengths of alcohol, changing every two to twelve hours through 70, 80, and 90 per cent. and absolute alcohol.

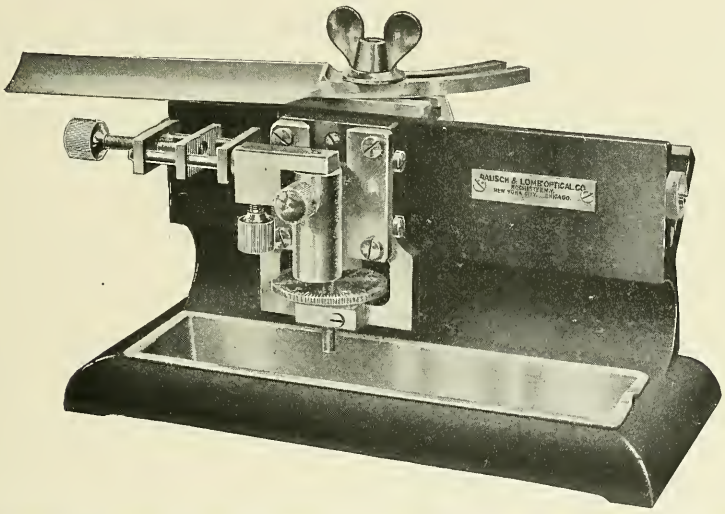
It is now necessary to embed the section in a substance that will

permeate the tissue, fill up all spaces, and give support to the section while being cut and mounted.

The embedding of a specimen in celloidin follows upon the hardening process. For general purposes the celloidin method is preferred. From absolute alcohol the section is placed in equal parts of sulphuric ether and absolute alcohol for from six to twenty-four hours, depending upon the size of the section. Next the section is transferred to a dilute solution of celloidin in ether for from six to twenty-four hours; it is then placed in a thick solution of celloidin in ether for an equal time, when it is ready to mount upon a cork for sectioning.

After blocking the specimen on wood or cork it is allowed to fix firmly in the open air or under a bell-jar, and is then placed in 70 per cent. alcohol for an hour or more. The section is now ready for cutting and mounting.

FIG. 60



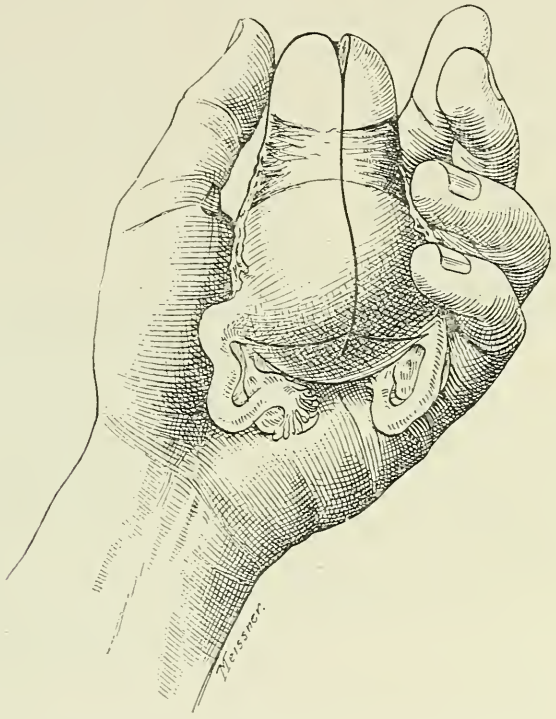
The student microtome. This is intended for individual and laboratory use when a mechanical microtome at small cost is required. It is extremely simple, yet very accurate in construction. This is one of the few models which have remained practically unchanged, showing that it is adapted for its work. The stand is one solid piece of metal. The knife block is as heavy as is consistent with the size of the instrument. The feed arrangement is carried in a metal stirrup attached permanently to the front of the stand, and consists of an accurately cut micrometer screw having a pitch of 0.5 mm., with a graduated head divided to 100 parts, each graduation, therefore, having a value of 5 microns. The object clamp is adjustable in two planes, and can be set for paraffin or celloidin cutting.

The embedding of specimens in paraffin is an excellent method for general laboratory purposes, but is somewhat complicated for private laboratory use. When the tissues are soft and small, as in scrapings, ideal sections are prepared by this method. For serial sections no other method can be employed. After thoroughly dehydrating the tissue the specimen is immersed in a solution of zylol and paraffin, or in chloroform and paraffin, for from two to twenty-four hours, and is kept at a uniform temperature of 37° C. Next the specimen is immersed in melted paraffin for a like time and kept at a temperature

of 48° to 50° C. It is then removed to a cool place and is quickly solidified in the paraffin, after which it is blocked out with a knife and mounted on a cork for cutting.

Method of Staining and Mounting Sections.—**Celloidin Sections.**—For all practical purposes the hematoxylin-eosin stain is most satisfactory. After cutting the sections and immersing them in water for a few moments the following method is adopted:

Fig. 61



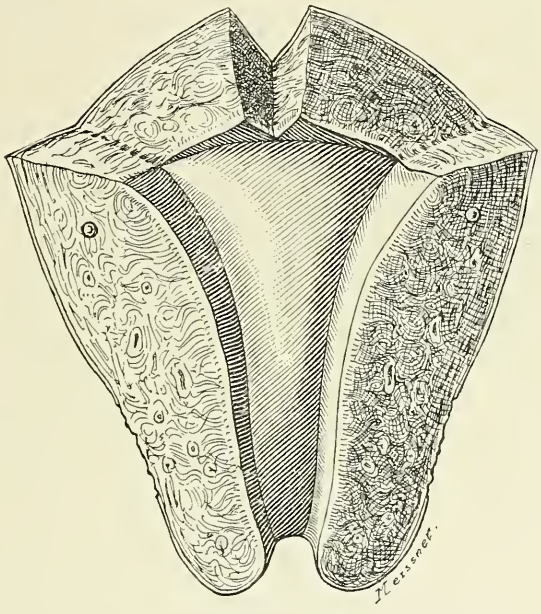
Lines of incision in opening the uterus after hysterectomy.

1. Stain in hematoxylin one to two minutes.
2. Decolorize in acid alcohol.
3. Immerse in weak ammonium-water until the blue color returns.
4. Immerse in water to remove the ammonium.
5. Counter-stain in eosin from ten to thirty seconds
6. Immerse in 75 per cent. alcohol two minutes.
7. Absolute alcohol one minute.
8. Clear in creosote or oil of cloves.
9. Mount in Canada balsam.

Paraffin Sections.—After cutting the sections they are carefully transferred to a shallow basin of warm water, on which they spread in thin ribbons. The water must not be hot enough to melt the paraffin,

but merely sufficiently so to unfold the sections and spread them out smoothly. A glass slide is held underneath the sections, and they are made to float upon the slide. The slide is then withdrawn from the water, the water drained off from the slide, when it is placed for several hours on the top of an oven or radiator, where the moisture is thoroughly driven from the slide and the section firmly fixed. The paraffin is dissolved in zylol or chloroform (by which the section is "cleared"), and from this point on the staining is carried out in the usual manner.

Fig. 62



The uterine cavity exposed.

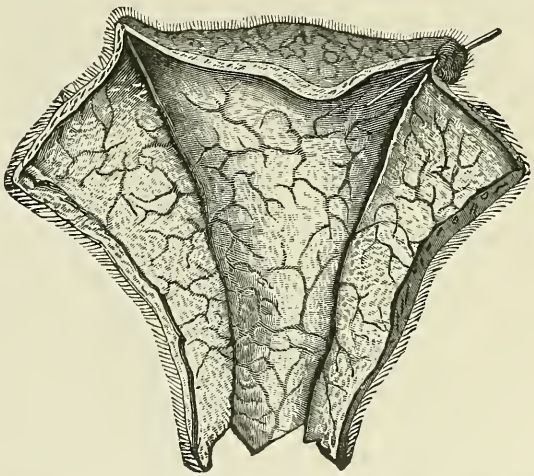
Inspection of the Uterus after Removal.—In order that a satisfactory examination may be made of the uterus after its removal, the operator should handle and mutilate the specimen as little as possible. The introduction of swabs, probes, and curets injures the endometrium and leads to false observations. Fig. 61 shows the method of opening the uterus. The body of the uterus is grasped by the left hand. Two incisions are made, as shown in Fig. 61 and the uterus is spread open in such a manner that the entire mucosa will be exposed (Fig. 62). Before the uterus is opened it is always well to fix it in Zenker's fluid for several days. The structures are thereby less disturbed in their relations.

The color, consistency, outline, and measurements are all to be noted and recorded. Foreign growths and abnormalities are described in detail.

THE DIAGNOSIS OF EXPELLED MEMBRANES FROM THE UTERUS

The physician will be called upon to determine the nature of a membrane or mass spontaneously expelled from the uterus. Here the microscope is indispensable to a positive diagnosis. It is of prime importance to determine, first, whether or not the membrane is organized. If on placing the membrane in cold water it becomes friable and disintegrates it is unorganized. Under the microscope a fibrinous structure is seen, in the meshes of which are blood cells in all stages of disintegration. Calcareous concretions may be expelled spontaneously or removed by the curet. They probably come from calcareous deposits in mucous polyps or submucous fibroids.

Fig. 63



Cast from uterine cavity in exfoliative endometritis, membranous dysmenorrhea, natural size. (After Costa.)

Of the organized structures the following will be considered: the decidua of intra-uterine pregnancy, the decidua of extra-uterine pregnancy, the decidua of menstruation, and the vesicles of hydatiform mole.

Membranous Dysmenorrhea (Exfoliative Endometritis).—Because of the occurrence of menstruation accompanied by a discharged membrane and great pain the condition is spoken of as membranous dysmenorrhea; but since the discharged membrane does not resemble that of the uterine mucosa during menstruation, but does closely resemble interstitial exudative endometritis, a better term to employ would be exfoliative endometritis. This does not imply that the lesion is necessarily inflammatory in origin, inasmuch as there are no known facts to substantiate such an assertion. Nothing definite is known of the cause of this lesion.

The first clinical observations were made in 1723 by Morgagni. When the existence of pregnancy can be excluded beyond all possible doubt a clinical diagnosis is made. When there is any possibility of pregnancy a positive diagnosis can only be made by a microscopic examination of the discharged membrane, and even here difficulties will arise because of the presence of large connective-tissue cells resembling decidual cells.

FIG. 64

Aborted ovum. Decidua and ovum complete. *o. i.*, corresponds to the decidua situated at the os internum; *t t*, to the decidua situated at the openings of the tubes. (Jewett.)

Macroscopic Examination.—The membrane rarely appears as a complete cast of the uterus. In form it is triangular, presenting an opening at each angle—*i. e.*, the internal os and the uterine ends of the Fallopian tubes. The outer surface is shaggy and of a dull gray color; it is sometimes overlaid with a coagulum of blood. Opening the sac, nothing is found within to suggest fetal remains. The inner surface is smooth and presents numerous small openings which represent the mouths of glands. The membrane is 1 to 3 mm. thick.

Microscopic Examination.—In general the membrane may be said to resemble exudative interstitial endometritis. The surface epithe-

lium may be intact or partially or wholly lost. The glands are irregularly compressed and widely separated. A rather characteristic feature is the zigzag course of the glands. The stroma is more or less crowded with small round cells. In the lower strata are frequently seen large connective-tissue cells which closely resemble decidual cells. The presence of these cells sometimes makes it difficult and at times impossible to distinguish the membrane from the decidua of pregnancy. C. Ruge called attention to the fact that decidual cells are not evidences of pregnancy; that these cells are found in occasional forms of endometritis.

In exfoliative endometritis these connective-tissue cells are less uniformly enlarged than in the decidua of pregnancy, and upon this fact the diagnosis must largely be based.

THE DIAGNOSIS OF EXPELLED MEMBRANES

		Decidua of intra-uterine pregnancy.	Decidua of extra-uterine pregnancy.	Decidua of menstruation.	
Clinical features.		Symptoms and signs of pregnancy; hemorrhage and pain accompanying the discharged membrane; no extra-uterine pelvic tumor.	Symptoms and signs of pregnancy; often irregular hemorrhage and pain accompanying the discharged membrane; extra-uterine pelvic tumor.	No evidence of pregnancy; no extra-uterine pelvic tumor.	
Macroscopic findings.		Thick shreds with shaggy surface, or smooth, glistening membrane.	Rough fibrous membrane; no villous structures; irregularities on inner surface.	*Unorganized.* Fibrinous structure, external surface smooth, internal surface rough.	*Organized.* Triangular cast of uterus, or bits of membrane; surface smooth with sieve-like depressions.
Microscopic findings.	Surface epithelium.	Seldom present.	Flattened; may be wanting.	Absent.	Cylindrical, rarely flattened or lost.
	Glands.	Compressed above, widely dilated and very irregular below; epithelium flattened.	Changes similar to intra-uterine pregnancy, though less marked.	Absent.	Zigzag in their course; epithelium cylindrical.
	Stroma.	Typical decidual cells.	Deciduel cells not so large; more intercellular substance.	Fibrinous network.	Round-cell infiltration; protoplasm of cells increased.
	Vessels.	Very widely dilated; walls composed of endothelium; no musculature.	Less widened blood spaces.	Absent.	As found in endometritis.
	Fetal tissue.	Chorionic villi, amnion.	Absent.	Absent.	Absent.

Decidual cells are hypertrophied connective-tissue cells. There are causes of hypertrophy of these cells other than pregnancy, and hence it is that decidual cells are not pathognomonic of pregnancy. The only positive evidence of pregnancy in discharged membranes is the presence of chorionic villi.

CHAPTER IX

ECTOPIC OR EXTRA-UTERINE PREGNANCY[1]

Etiology
Recurrent and Multiple Ectopic Pregnancy
Combined Uterine and Tubal
Bilateral Tubal
Classification
Ampullar
Interstitial
Infundibular
Ovarian
Causes of Ending of Gestation
Retrogressive Changes in Dead Fetus
Anatomical Changes in Tube
Clinical Diagnosis
Subjective Signs
Objective Signs
Differential Diagnosis
Treatment
Unruptured Tubal Pregnancy
At Time of Rupture
Late after Rupture
Intraligamentary Extra-uterine Pregnancy
Interstitial Pregnancy
Advanced Extra-uterine Pregnancy
Combined Extra-uterine and Intra-uterine Pregnancy
Ovarian Pregnancy
Pregnancy in Rudimentary Horn of Uterus
Mortality of Extra-uterine Pregnancy

Etiology.—Predisposing Causes.—1. Mechanical interference with the passage of the ovum through the tube from—

(*a*) Tumors in and about the tube—*i. e.*, mucous polyps, ovarian and parovarian cysts.

(*b*) Persistence of the fetal type—small lumen and convoluted course of the tube.

(*c*) Peritoneal bands constricting the tube and drawing it out of position.

(*d*) Congenital anomalies in development, namely, diverticuli and rudimentary fimbriæ.

(*e*) Malpositions of the tube, either congenital or acquired.

2. Loss of cilia and epithelium through inflammation.

Gonorrhea has been mentioned by Gottschalk, Braun-Fernwald, and Bandler as a frequent forerunner of tubal pregnancy. Tuberculous and puerperal infections of the tube play a less important but by no means insignificant role. Erich Opitz detected signs of inflammation in all of his 23 cases.

Essential Cause.—While the conditions above enumerated are frequently present, it is a matter of common observation that tubal pregnancy may occur in an apparently normal tube.

Webster affirms that in ectopic pregnancy there is a genetic reaction

[1] The author acknowledges his indebtedness to J. Clarence Webster, from whose monograph on Ectopic Pregnancy much of the material in this chapter on the classification and diagnosis has been taken.

in the tube which is essential to the implantation and development of the ovum in the tube, as truly as a similar genetic reaction in the uterus is essential to uterine gestation. This genetic reaction consists in the formation of decidual tissue. It is claimed by Webster that a decidua, however limited, is always found in the pregnant tube. Without a decidua the ovum would find no abiding place in the tube, even in the presence of predisposing causes. In the event of a decidual formation in the tube the predisposing causes serve to obstruct the passage of the ovum, and make possible the implantation of the ovum in the tube rather than in the uterus.

Fig. 65

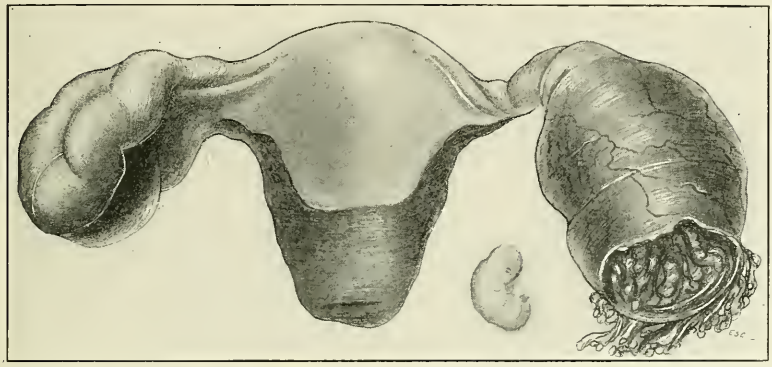
Ectopic gestation in a blind accessory fimbriated extremity of the right tube. (Jewett.)

Ectopic pregnancy may occur at any time during the period of sexual maturity, but its greatest frequency is between the ages of thirty and forty. It is stated that a long period of sterility predisposes to ectopic pregnancy, probably because of the existence of one or more of the predisposing causes. Tubal gestation occurs five times as frequently in multiparæ as in primiparæ—a fact which may again be explained on the ground of the development of the predisposing causes.

Recurrent and Multiple Ectopic Pregnancy. — Recurrence of Tubal Pregnancy in the Same Tube or in the Opposite Tube.—Occasionally there are reports of cases in which a second, third, or even fourth pregnancy has occurred in the same tube or has occurred alternately in both tubes. In a case of Grandin the second pregnancy was recognized only two months subsequent to the first tubal pregnancy. H. C. Hindler reported a case recurring in the stump of a tube that had been previously amputated for tubal pregnancy.

Multiple Ectopic Pregnancies.—There may be twin pregnancies in one tube, in both tubes, or in the uterus and one tube. Again, the uterus and both tubes may each contain an ovum.

FIG. 66



Tubal abortion on right side; hematosalpinx on left side, the result of a tubal pregnancy one year previous. The uterus is reconstructed.

Dr. Richard R. Smith reported 170 cases of ectopic pregnancy which recurred one or more times; four of these cases were his own. The author has had but one such case. The fact that the opposite tube may subsequently become pregnant after the removal of a pregnant tube is no argument in favor of removing a healthy tube in the presence of a pregnancy in the opposite tube. Smith finds less than 4 per cent. of recurrences in the opposite tube. Hindler reported a case recurring in the stump of a tube that was previously removed for tubal pregnancy.

Combined Uterine and Tubal Pregnancy.—Hanna found 69 cases of tubal pregnancy associated with uterine pregnancy. Vilkin reported 68 cases in literature, in 20 of which both fetuses approached maturity. Simpson reviewed the history of 113 cases, and added one of his own. He gives the following classification:

Class 1. The woman becomes pregnant while carrying the dead products of an ectopic gestation.

Class 2. The ectopic and uterine gestation are both living at the same time.

(*a*) Ectopic gestation precedes the uterine.

(*b*) Ectopic gestation follows the uterine.

(*c*) Ectopic and uterine gestation occur coincidently.

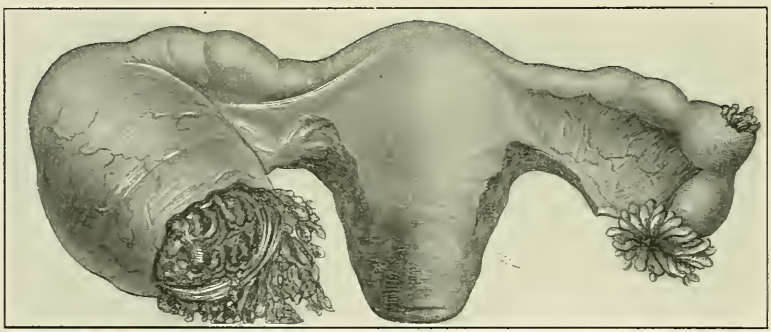
Bilateral Tubal Pregnancy.—A review of the literature on ectopic gestation discloses the records of a large number of cases in which pregnancy has occurred in the same tube or in the opposite tube. Almost as frequent are the references to combined tubal pregnancy and uterine pregnancy. Several cases of twin pregnancy in a single tube and one of triplets are recorded. The author has been able to find

records of 28 cases of bilateral tubal pregnancy, but in the majority of these cases the proofs are by no means conclusive.

Bland Sutton quotes Parry as follows: "Twin conceptions are much more frequent in extra-uterine than they are in normal gestation (four to one). It is a striking fact, however, that both children are rarely developed in the same locality. In a large majority of these tubal conceptions one ovum finds its way into the interior of the uterus, while the other is arrested at some point in its descent. This fact has led Professor Barnes to believe that twin conception is one cause of extra-uterine pregnancy." Bland Sutton fails to concur in the views of Parry.

In reviewing the reports of cases of bilateral tubal pregnancy, it is evident that in some the products of conception were of simultaneous development; in others it is equally clear that the development of the two ova was not of the same period, and in the majority of cases there was no conclusive evidence on this point.

FIG. 67



Bilateral tubal pregnancy (coincident development). Right tubal abortion, left tubal rupture. (Findley.)

Of the 28 cases reported as examples of bilateral tubal pregnancy, but 8 are unquestioned. Of the 20 cases of doubtful identity, the clinical diagnosis was not supported by the macroscopic and microscopic findings of fetal structures in the two tubes.

In the case (Fig. 67) which was reported by the author[1] there was the escape of the ovum and blood through the abdominal end of the left tube and of its twin, through a rent in the ampulla of the right tube.

Placental tissue, decidua, and chorionic villi were found in both tubes, but neither fetus was discernible. Both ovaries were cystic and were bound by adhesions to neighboring structures. In the right ovary was a fresh corpus luteum.

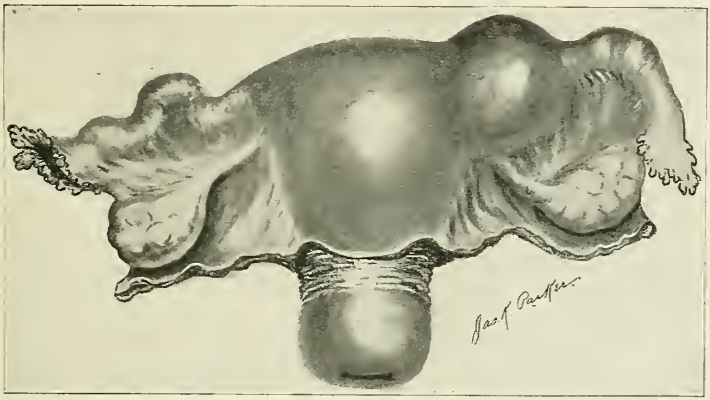
Classification.—In nearly three-fourths of the cases the ovum develops in the ampullary portion of the tube and with about equal frequency in the interstitial and fimbriated portions.

[1] Surgery, Gynecology, and Obstetrics, July, 1910.

Ampullar Tubal Pregnancy.—The gestation begins in the ampullar end of the tube. Ampullar tubal pregnancy may persist as such, or the gestation sac may rupture from the tube.

Persistent.—In rare instances the gestation in the ampulla may go to full term. The gestation sac is pedunculated, movable, incarcerated, or fixed by adhesions. When confined to the pelvis the uterus and ovary are crowded to the opposite side; when large and lying in the abdominal cavity the uterus may not be displaced. As a rule, the gestation sac lies at the side of or behind the uterus, rarely between the bladder and uterus. Adhesions may firmly bind the tube, uterus, and ovary together.

Fig. 68



Ectopic pregnancy located in the uterine end of the tube. This might be called a tubo-interstitial pregnancy, inasmuch as the uterus formed a part of the gestation sac. The pregnancy had advanced about eight weeks. Rupture had not occurred. (Specimen reconstructed.)

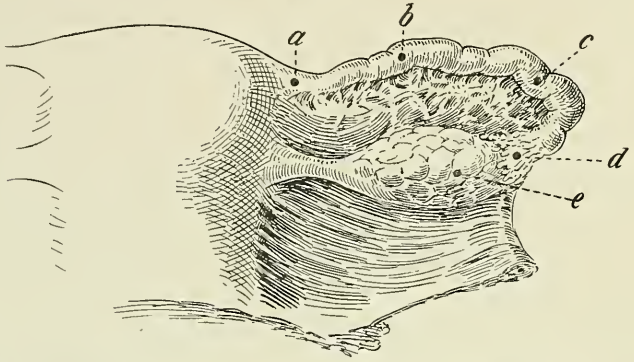
Rupture.—Rupture may occur early. The most likely exit is between the layers of the broad ligament, though not infrequently it ruptures into the free peritoneal cavity.

Intraligamentary Gestation.—The ovum escapes through the lower segment of the tube between the layers of the broad ligament. Here the ovum may perish or go on to full development. Rupture usually takes place not later than the fourteenth week. The escape of the fetus and blood may be gradual or abrupt. The process may be so gradual that no general disturbance will be caused, and, on the other hand, the fetus and blood may be discharged in such a manner as to occasion profound shock. As the gestation sac enlarges the layers of the broad ligament are separated, the pelvic viscera are pushed to one side, the peritoneum is stripped from the bladder, uterus, rectum, and pelvic wall. Later, as the gestation sac increases in size, it burrows beneath the parietal and visceral peritoneum, crowding the viscera forward and to the opposite side.

The placenta may remain attached to the tube or escape with the fetus between the layers of the broad ligament and become attached

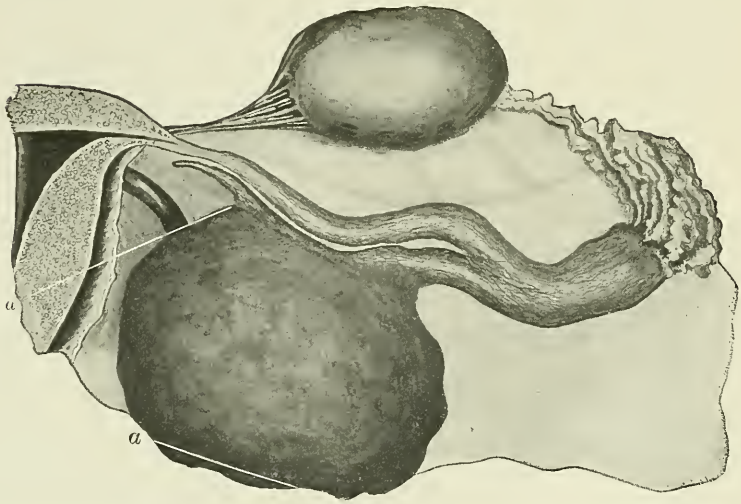
to any of the raw surfaces. The tube may be stretched out over the gestation sac as a mere ridge. Rupture into the peritoneal cavity may take place at any time after the escape of the ovum and blood between the layers of the broad ligament. The danger to life in such an event is imminent, and immediate surgical interference is imperative.

Fig. 69



Schematic drawing showing locations of ectopic pregnancy. *a*, interstitial; *b*, ampullary; *c*, infundibular; *d*, tuboövarian; *e*, ovarian.

Fig. 70



Left Fallopian tube with ectopic gestation in diverticulum. *a*, *a*, gestation sac communicating with diverticulum. (Jewett.)

Tuboperitoneal Gestation.—In tuboperitoneal gestation the placenta remains in the tube and the fetus escapes into the peritoneal cavity. The probability of such a condition was long held impossible. The first authentic case reported was that of Croom. Webster made sectional, dissectional, and microscopic studies of the case, and proved

PLATE VIII

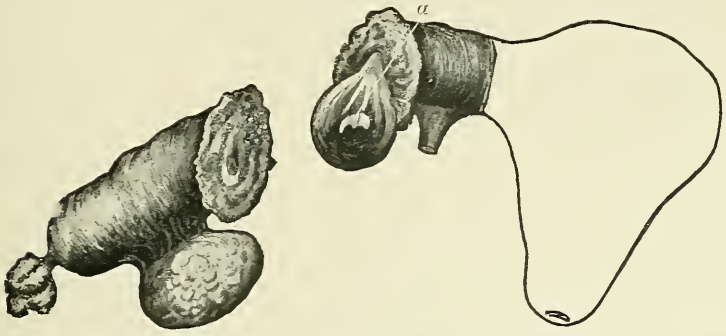
Secondary Abdominal Pregnancy at Eight Months, Primarily Tubal.

The primary attachment of the placenta is plainly discernible at the original tubal site. After rupture the placenta grew and became attached to a large surface on the anterior abdominal wall. The child was delivered through a retrouterine vaginal incision. (Jewett.)

the existence of tuboperitoneal gestation beyond dispute. Webster holds that it is as yet unproved that a fetus can escape into the peritoneal cavity free of its investing membranes and then develop to full term; he doubts the probability of such an occurrence. Furthermore, it is as yet unproved that the early complete ovum can escape into the peritoneal cavity and then go on to develop. As stated by Webster, it is inconceivable that a villous-covered ovum can escape into the peritoneal cavity and there await the development of intervillous blood spaces.

Gestation may terminate by rupture of the tube and escape of blood into the free peritoneal cavity. The amount of blood lost may be insignificant and occasion no constitutional effects; while, again, the blood may instantly escape in such large amounts as to jeopardize the life of the mother and fetus unless surgical intervention is prompt. The consequences to the mother are, therefore, dependent upon the extent of the tear, the rapidity with which the blood is allowed to escape,

FIG. 71



Primary intraperitoneal rupture; fifth week. Tube completely ruptured. *a*, ovum still slightly adherent to its original site. (Jewett.)

and, finally, upon timely surgical interference. The fetus may plug the opening and prevent the escape of much blood, or the blood may escape at intervals and eventually assume large proportions without seriously depressing the patient. (See Plate VIII.)

Interrupted hemorrhage may also be due to contraction and retraction of the tube and bloodvessels. Though the quantity of blood lost in interrupted hemorrhages may be equally as great as in the immediate escape of blood, the effect upon the mother is far less serious. The later in pregnancy the rupture occurs the more serious the consequences, because of the unusual size of the rent, the failure of the muscular wall to retract, the presence of large blood sinuses, and the failure on the part of the fetus to be absorbed.

Prior to the end of the second month, if rupture takes place, the hemorrhage will usually not be great, and the fetus will almost certainly be absorbed. Rupture has been known as early as the second week. The time of greatest frequency for rupture to occur is from

the sixth to the fourteenth week. The greatest number rupture in the second month.

The escaped blood accumulates in the most dependent portion of the pelvic cavity. There it is rapidly coagulated, and is later absorbed, suppurates, or is organized.

Fritsch says there is no case of pelvic hematocele in which ectopic pregnancy can be positively ruled out; while, on the other hand, such authorities as Kober and Freund have reported cases. It is unusual for acute peritonitis to follow the development of a hematocele, though it is the rule for peritoneal adhesions to form about the mass of escaped blood.

FIG. 72

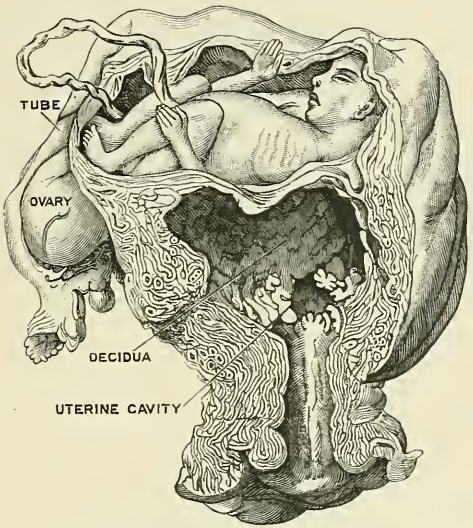
Tubal abortion. A large intraperitoneal hemorrhage occurred in the second month of pregnancy. The tube is dark red and larger than a man's thumb. From the abdominal end of the tube a blood coagulum is seen to escape.

Interstitial Tubal Pregnancy.—In this form the portion of the tube lying within the uterine wall encloses the gestation sac. This is an unusual location. There may be tubo-uterine pregnancy, in which the ovum lies partly within the interstitial portion of the tube, and partly within the uterine cavity. Again, the ovum may first develop within the interstitial portion of the tube, and later be expelled into the cavity of the uterus ("tubal abortion"). The gestation sac forms a part of the uterine tumor, and lies within the attachment of the round ligament —all other forms of tubal pregnancy lie external to the round ligament. Interstitial pregnancy may go on to full term; the fetus may die at any period of its development, or, finally, rupture of the tube may permit the ovum to escape into the uterine cavity between the layers of the broad ligament or directly into the peritoneal cavity. In any event, the resulting hemorrhage may be fatal.

Infundibular Tubal Pregnancy.—The ovum is found in the infundibulum. This is an unusual condition. The behavior is similar to that of ampullar pregnancy. The tube is likely to adhere to surrounding structures, and by adhering to the ovary a tuboövarian pregnancy becomes possible.

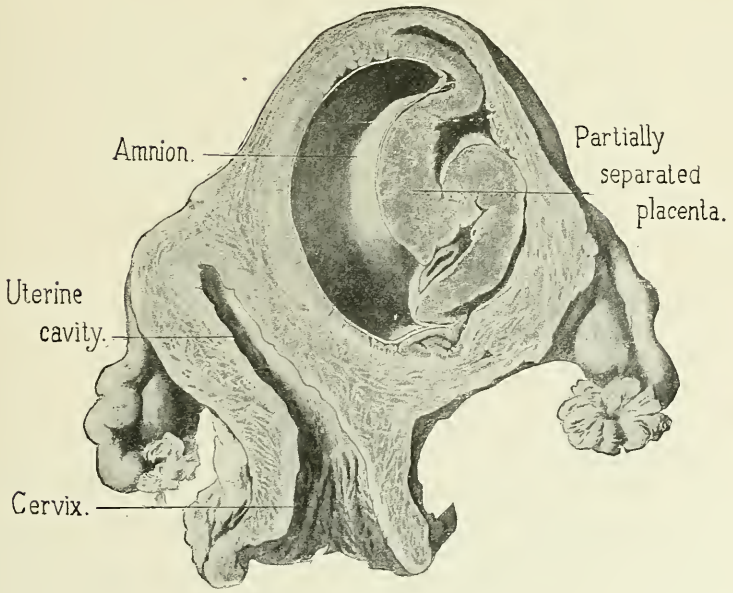
Ovarian Pregnancy.—Contrary to earlier conceived notions primary ovarian pregnancy does exist. Two cases of ovarian pregnancy are reported by Webster. About 20 cases are now on record.

FIG. 73



Interstitial pregnancy. (Sutton.)

FIG. 74



Interstitial pregnancy. (Bumm.)

Williams collected 13 positive and 22 probable cases from the literature. Eleven of this number progressed to full term, which suggests that the ovary is more capable of accommodating the growing ovum than is the tube. No definite decidua was found in any of the cases. The ovum advanced to full term or died *in situ* in a minority of the cases. Rupture with escape of blood and fetus was the rule.

Causes of Ending of Gestation.—The Formation of a Hematoma.—The accumulated blood destroys the life of the fetus. Rupture of the tube has been known to occur after the death of the fetus (Braun-Fernwald). The growth of the placenta subsequent to the death of the fetus is the probable cause of rupture. The lower the attachment of the placenta the greater the hemorrhage, and hence the greater the likelihood that the life of the fetus will be destroyed. The escaped blood, if large in amount, may undermine the peritoneum, and sometimes encircles the uterus and rectum and displaces the uterus. Coagulation of the blood is rapid, and eventually complete absorption of the clots or the organization of the clots into adhesions follows, unless, perchance, the escaped blood suppurates and forms a pelvic abscess.

Fig. 75

Ampullar tubal pregnancy. Fetus surrounded by a blood coagulum.

Suppuration.—This event is usually late in its occurrence. It is unusual for an acute abscess to follow a hematoma of the pelvis. The more intimate the relation to the bowel the greater the liability of the escaped blood to suppurate. If the abscess is not opened by surgical means it may become absorbed, but will more probably find its way to a hollow viscus or externally through the vagina or

PLATE IX

Fig. 1

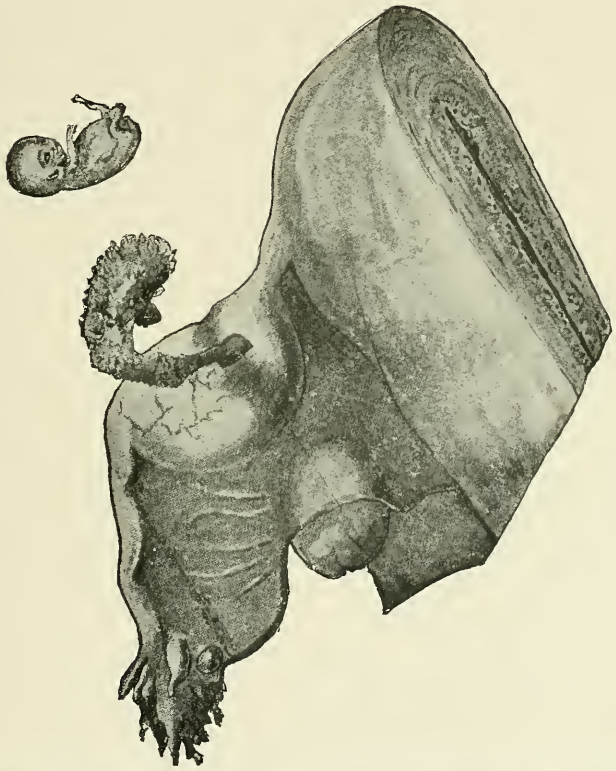
Fig. 2

Ovarian Pregnancy. (Webster.)

abdominal wall. Parry reports a case in which rupture occurred thirty-two years after the formation of an abscess. Twelve cases are recorded in which the fetus was discharged through the bowel.

Tubal Abortion.—By tubal abortion is meant the escape of the ovum through the fimbriated end of the tube into the peritoneal cavity. This implies that the tube must be patent at its fimbriated end. According to Dobberts, tubal abortion is three to four times as frequent as rupture of the tube. All authorities agree that it is much more frequent

Fig. 76



Intraligamentary rupture of a tubal pregnancy. Rupture at the isthmus, with escape of the fetus. (Jewett.)

than rupture of the tube. The contractions of the tube expel the ovum, forcing it in the direction of least resistance. The nearer the attachment of the ovum to the fimbriated end of the tube the greater the likelihood of abortion. Hemorrhage is rarely considerable. The author removed two gallons of blood from the peritoneal cavity as the result of tubal abortion. All that has been said of tubo-abdominal gestation in reference to the fate of the mother and ovum applies to tubal abortion, though with less force. The hemorrhage is rarely so

great and the fetus is usually absorbed. Hence the mother may and indeed often does suffer but little (Fig. 72).

Formation of a Mole.—The fetus dies and is preserved in its entirety, forming a fleshy mole. The death of the ovum is caused by an escape of blood into the fetal membranes. At first the mass appears like a fresh, firm, blood-clot. Later it organizes and becomes paler as the blood absorbs.

The Formation of an Adipocere, a Lithopedion or Mummy.—When the fetus is far advanced in its development it is liable to one of these formations.

Retrogressive Changes in a Dead Fetus.—Mummification.—Mummification is a process of desiccation in which the water is extracted from the fetus. In addition a deposit of earthy salts is often superimposed.

Calcification.—In calcification the fetal membranes and placenta and rarely the superficial parts of the fetus are permeated and incrusted with lime salts. A dense incrustation is seldom formed. It is not uncommon for an adhesive peritonitis to develop about the lithopedion. The petrified ovum may remain in the tube, in the peritoneal cavity, or between the layers of the broad ligament for years without creating serious disturbance. Well-formed children may be born while the parent still carries a lithopedion.

Adipocere Formation.—In adipocere formation the ovum is converted into a soap-like mass. Calcareous deposits may be found in the fetal structure.

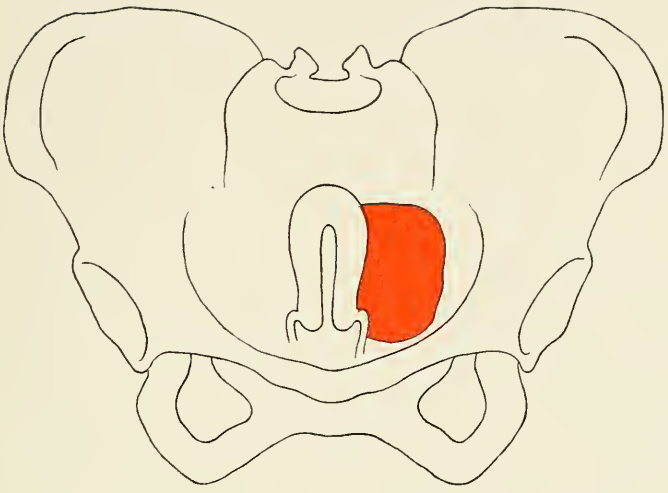
Gangrene of the Fetus.—Gangrene of the fetus may result, and if surgical interference is not instituted, death from septic infection and peritonitis will probably follow.

Anatomical Changes in the Tube.—Mucous Membrane.—In the tubal mucosa decidual changes are always to be found (Webster). This view is not universally accepted. Webster has never failed to demonstrate a decidua in the tube, but finds great variation in the location and extent of the development. The early specimens show this so-called genetic reaction more clearly than do the advanced cases. The decidua may be confined to a narrow ring about the tube. It is, therefore, not strange that conflicting statements are made concerning the presence of a decidua in the tube, for it is often necessary to make sections from various portions of the tube.

As in uterine pregnancy, so in the tube, a decidua vera, reflexa, and serotina are usually found. The decidua vera is composed of a spongy and compact layer, as in uterine pregnancy. In the compacta the decidual cells are closely packed together, while in the spongy layer they are separated by gland-like spaces formed by mucous folds. In later months the distinction between the compact and spongy layers is lost. In the earlier stages the surface epithelium remains intact, but as time goes on the cilia are lost, the surface cells become flattened, and, finally, wholly disappear. As in the endometrium, the decidual cells are derived from the connective tissue of the mucosa. They are

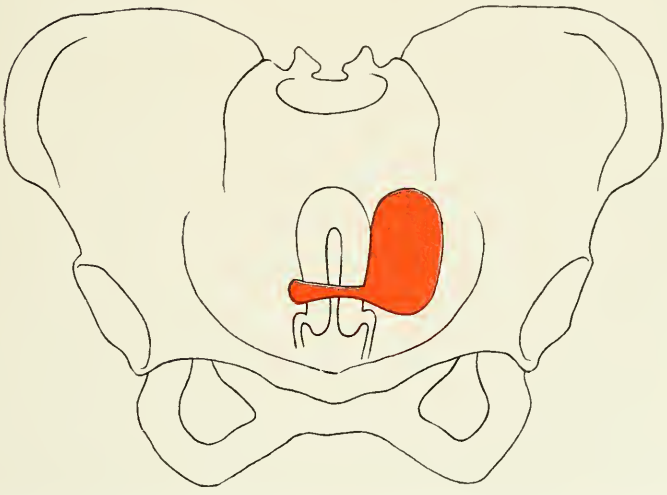
PLATE X

Fig. 1



Hematoma of the Left Broad Ligament Lying Close to the Uterus.

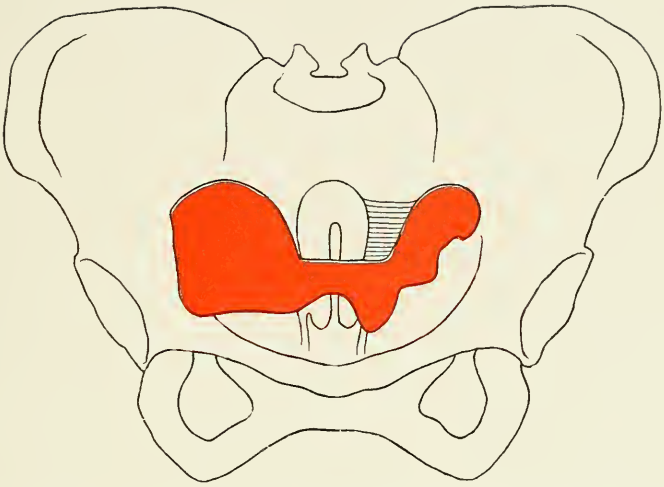
Fig. 2



Hematoma of the Left Broad Ligament and Extending in Front of the Cervix to the Right Side of the Uterus.

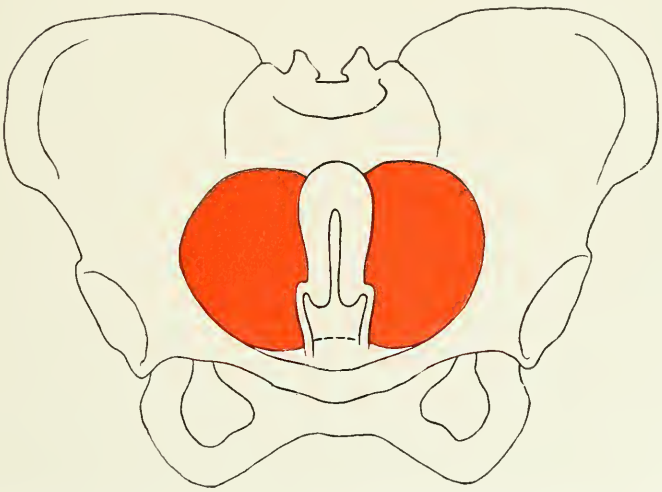
PLATE XI

Fig. 1



Hematoma of both Broad Ligaments Extending in Front of the Uterus.

Fig. 2



Hematoma of both Broad Ligaments Connected Behind the Uterus.

essentially greatly enlarged connective-tissue cells, and show great variation in size and form. In far-advanced cases these cells become elongated into a fibrous structure and lose their decidual character.

The decidua serotina, that portion of the decidua known as the placental site, is relatively larger than the serotina of the pregnant uterus.

The decidua reflexa may or may not be present. Some authorities disclaim its existence. According to Webster, the tube lumen may be so small that the ovum, pressing upon the wall of the tube, makes the formation of a decidua reflexa impossible. On the other hand, the tube lumen may be exceptionally large, in which case a complete reflexa may be formed. As the ovum develops the reflexa becomes thin and early disappears.

Beyond the attachment of the ovum the tubal mucosa may not suffer change; occasionally, however, decidual changes are recognized throughout the entire mucosa of the tube. As the ovum enlarges and fills the tube, the surface epithelium is compressed and wholly disappears; so, also, with the decidua.

The muscular wall of the tube varies in thickness in different sections and in the various stages of pregnancy. In the early months the musculature thickens through hypertrophy. In the later months pressure and stretching of the musculature may cause all traces of muscle fibers to disappear.

The peritoneal covering of the tube is stretched by the growing ovum and inflammatory adhesions may form about the tube.

Regarding the fetal membranes, there is little that differs from the membranes of normal uterine gestation.

The Clinical Diagnosis.—Huggins believes that a diagnosis should be made in 80 per cent. of unruptured cases provided the physician is called in time. To achieve this it is necessary that the previous history, as well as the present complaints of the patient, be very carefully considered.

Consideration of the History.—The examiner should go back years into the history for the discovery of symptoms suggestive of tubal infection. These symptoms may have been pronounced at one time or they may have been mild from the beginning. A history of a latent gonorrhea in the husband may be the first suggestion of a possible tubal involvement in the wife. A period of sterility is presumptive evidence of tubal involvement. When the patient has had a perfectly normal menstrual history and at examination presents definite irregularities, such as delayed onset of the menstrual periods or excessive and possibly painful periods, a suspicion of ectopic pregnancy is awakened. Again, when the menstrual period has been missed for from one to three weeks and then begins with pain in the hypogastrium, the possible presence of ectopic pregnancy should be considered.

The clinical diagnosis of ectopic pregnancy is made, first, by establishing the fact of pregnancy, and, second, by locating the gestation sac. The subjective signs are of value in establishing the fact of

pregnancy, but the location of the gestation sac can only be determined by a physical examination.

Subjective Signs.—The subjective signs may not differ materially from those of uterine pregnancy of a similar age. In the early weeks of an ectopic gestation the patient is seldom aware of any unusual complications, while in the later months the symptoms rarely conform to those of normal pregnancy, and give rise to feelings of apprehension on the part of the patient. Not so with the physical signs; these are to be differentiated from the normal from the earliest time.

Cessation of Menstruation.—This occurs in about one-half of the cases. The hemorrhage, when present, comes from the endometrium.

Morning Sickness.—Morning sickness occurs at about the same time and to about the same extent as in uterine pregnancy.

Nervous Phenomena.—Nervous phenomena, such as ringing in the ears and despondency, are likely to be more marked than in normal uterine gestation.

Periodic Colicky Pains.—Periodic colicky pains are unlike anything that should occur in normal uterine pregnancy. It is this incident that commonly first attracts the patient's attention to her condition. These pains are said to be due to the contractions of the uterus and pregnant tube. In character they are intermittent and cramping, and are located in the region of the uterus and affected tube. During these pains rupture of the gestation sac may occur.

Objective Signs.—The objective signs differ essentially from those of uterine gestation.

Mammary Glands.—The mammary glands do not often show the marked changes accompanying uterine pregnancy. The areola is poorly marked and the secretion of colostrum is scant.

Discoloration of the Vulva and Vagina, Softening of the Vaginal Portion of the Cervix, and Compressibility of the Lower Uterine Segment.—These may all be present, but seldom to the degree found in uterine gestation.

Active Fetal Movements.—Active fetal movements may be recognized earlier and with greater ease than in uterine pregnancy, provided the fetus lies in close proximity to the abdominal wall. Later on the movements may be readily seen through the parietes.

Intermittent Uterine Contraction.—Intermittent uterine contractions are often present, though not to the degree found in uterine pregnancy.

Direct Palpation.—Direct palpation of the fetal parts may be very difficult and obscure, or very easy, depending upon the relation of the fetus to the abdominal wall.

Auscultation.—(*a*) Fetal heart tones are heard with varying degrees of distinctness, depending upon the development of the fetus, its relation to the abdominal wall and upon the thickness of the latter. (*b*) The fetal souffle is rarely heard, and only in the latter half of pregnancy. (*c*) The placental souffle is rarely heard after the third month, and only on the side occupied by the gestation sac.

The Rate of Growth, Form, Position, and Consistency of the Uterus.—These vary considerably from that of uterine gestation. While the uterus almost always enlarges, it never attains a greater size than that of a four months' pregnant uterus, and does not enlarge regularly and progressively as does the gravid uterus. The nearer the gestation sac is to the uterus the larger the uterus develops. Cases are recorded in which the uterus did not develop, but these are exceedingly rare.

The general contour of the uterus differs somewhat from that of the normal pregnant uterus. It retains much the same form as does the non-pregnant uterus. The transverse diameter is proportionately less, and there is no shortening of the cervix in advanced cases.

The uterus seldom lies in the median line, but is usually crowded to one side by the gravid tube.

In consistency the uterus changes, but not to the degree found in uterine gestation.

Discharge of the Uterine Decidua.—The discharge of the uterine decidua is an event peculiar to ectopic pregnancy. Part or all of the uterine decidua may be expelled at any time during the course of an ectopic pregnancy. As a rule, the decidua is expelled piecemeal, rarely in its entirety. Much blood may accompany the discharged decidua and completely mask the accompanying fragments. When ectopic pregnancy is suspected the escaped blood should be carefully preserved by the nurse for the inspection of the physician.

Histologically, the uterine decidua of ectopic pregnancy does not differ essentially from that of uterine gestation, the distinguishing feature being the absence of fetal structures.

Spurious Labor.—At full term pains not unlike those of labor come on and constitute what is known as spurious labor. These pains may occur weeks before the end of full term, and, on the other hand, may altogether fail or be delayed one or more months beyond full term. The pains commonly continue a number of hours, as in normal labor, but have been known to persist for a week and longer. They vary in intensity and location; often they are severe and located in the side of the pelvis. A bloody discharge appears shortly after the onset of the pain, and with it there is usually a discharge of decidual membrane. The amount of blood lost may be alarming.

Following spurious labor the fetus always dies, the liquor amnii becomes absorbed, the gestation sac contracts, and the fetus undergoes changes previously referred to, namely, mummification, lithopedion, gangrene, or adipocere formations.

Intraperitoneal Hemorrhage.—An intraperitoneal hemorrhage should be suspected when a woman in the childbearing age experiences a sudden and severe abdominal pain with the appearance of extreme anemia and faintness. As the pallor increases the pulse becomes increasingly rapid and compressible and may become imperceptible, the respirations are sighing, restlessness develops, and the temperature becomes subnormal. The abdomen may become somewhat distended and tender, with more or less rigidity. Death may follow

within a few hours or the bleeding may be checked spontaneously and the patient recover.

Bimanual Examination.—An anesthetic will be found of immense advantage in making a bimanual examination, but should not be given if the patient is greatly depressed. Great variations are observed in the local findings of ectopic pregnancy. Vessels may be felt to pulsate in the vaginal vault, particularly on the side of the gestation sac. The vagina may be displaced and misshaped by the gestation sac and accumulated blood above. The vaginal walls may bulge at the sides and behind the uterus, and the vagina may be pushed far to one side.

The uterus is almost invariably displaced by the tumor mass. The most common displacement is forward and upward, because of the frequency with which the blood collects in the pouch of Douglas. The uterus is elongated, but is never so broad as in uterine gestation of a similar period of development. Its consistency is firmer than in uterine pregnancy, the lower uterine segment is not well-marked, and the cervix is not shortened.

The pregnant tube is not unlike the inflammatory swellings of the tube. Without other evidences of pregnancy it would be impossible to say, with assurance, that the tube is pregnant and not distended with blood, pus, or serum. As in sactosalpinx, the pregnant tube commonly lies low at the side of or behind the uterus.

In interstitial pregnancy the gestation sac forms with the uterus a single mass, distinguished by a more elastic consistency when contrasted with the firmer uterine tissue.

Exploratory Vaginal Incision.—Exploratory vaginal incision has been practised by Grandin and Spinelli as a last resort in the making of the diagnosis. If an exploratory vaginal incision reveals the presence of an ectopic pregnancy it is advised that the operation should immediately follow.

Exploratory Abdominal Incision.—Through an abdominal incision an accurate diagnosis can be made and the operation completed without delay.

Differential Diagnosis.—Diagnosis from Pregnancy in a Retroverted Uterus. — As the gestation sac of an ectopic pregnancy frequently lies behind the uterus, and since in the early months the size, form, and consistency of the uterus of an ectopic pregnancy do not differ widely from that of intra-uterine pregnancy, confusion is likely to arise. Here an examination under anesthesia is of the greatest value in locating the uterus and in clearly outlining it apart from any mass outside. In an ectopic pregnancy lying in the retro-uterine space the uterus lies well forward, and by its form and consistency can usually be outlined apart from the gestation sac. The anatomical distinctions between the pregnant uterus and the uterus of an ectopic pregnancy are to be borne in mind. In uterine pregnancy the uterus is more elastic and soft, the lower uterine segment is clearly defined, and the transverse diameter is relatively increased. The possibility of a combined uterine and extra-uterine gestation should be borne in mind.

Uterine Pregnancy Complicated with a Tubal or Ovarian Swelling may easily be confused with ectopic pregnancy. The difficulties are increased when the uterus is enlarged through inflammation (chronic metritis). Such a uterus, when gravid, will not have the usual elasticity and softness of a normal pregnant uterus. On the other hand, the abdominal wall and uterine musculature may be so thin as to give the impression that the fetus lies outside the uterus. In the first trimester the physical examination of the uterus alone can only serve to suggest the possibility of pregnancy. When from the size, position, consistency, and contour of the uterus pregnancy is suspected, the next step is to determine whether the adnexæ are enlarged from pregnancy, infection, or a new-formation. The history must be carefully considered, with special reference on the one hand to pregnancy and on the other to infection. The pregnant tube is usually of softer consistency and less tender than is an inflammatory swelling. More confusing still is the occasional occurrence of a tubal pregnancy implanted upon an inflammatory swelling of the tube. Here, and indeed in all cases, the history will be of the greatest value in making the differential diagnosis. The unilateral involvement of the tube is evidence in favor of tubal pregnancy, though bilateral tubal pregnancy is possible and unilateral involvement of the tube and ovary is common. A pregnant tube is not so likely to be fixed by adhesions as is an inflammatory swelling of the tube, and tenderness is not so great.

As a last resort, when a diagnosis is imperative, a sound may be passed into the uterus, or if there is evidence to support the belief that an abortion has occurred, the uterus may be curetted and a microscopic examination made of the scrapings. If decidua and fetal tissue are found in the scrapings the pregnancy must have been intrauterine.

The fact that no decidua is found is not conclusive evidence that tubal pregnancy cannot possibly be present, because it is possible that the decidua was previously expelled. This occurred in a case reported by Tanneus.

Diagnosis from Pelvic Exudate, Especially When following upon an Abortion.—A period of amenorrhea may be interrupted by uterine hemorrhage, without the recognition of fetal structures in the escaped blood. From such a history the examining physician is unable to decide whether it was a uterine abortion or a ruptured tubal pregnancy. If an examination is not made until some time has elapsed, and a mass is found in the pelvis, the question arises as to whether this mass is due to an inflammatory exudate or to a gestation sac and the escaped blood of a ruptured ectopic pregnancy. If an inflammatory exudate, the history should point to a pelvic infection following the abortion, to a rise of temperature, and to pain in the pelvis. The mass should be firmly fixed and tender. In ectopic pregnancy there is less tenderness and pain, and the general symptoms of sepsis are not present unless the mass has become infected. A very good general rule is that in a pelvic abscess the fever and high pulse-rate precede

the development of the pelvic exudate, while in ectopic pregnancy there is no fever or rise of pulse-rate before the development of the tumor. Furthermore, with the development of the inflammatory exudate the general symptoms of infection increase, while with the sudden appearance of an escaped mass following upon the rupture of a gravid tube the temperature is likely to become subnormal and be later followed by a moderate rise of temperature.

Finally, an exploratory puncture or incision through the vaginal wall will determine the true nature of the swelling. If a pelvic abscess develops it may not be possible to determine whether it was derived from an inflammatory exudate or from a secondary infection of an ectopic pregnancy. In the removal of the pus, fetal tissue may or may not be discovered either by the naked eye or by the microscope. The presence of blood-clots in the pus is highly suggestive of tubal pregnancy.

Diagnosis from Pregnancy in a Bicornate Uterus.—Pregnancy in a bicornate uterus may closely resemble an ectopic pregnancy. The diagnosis may be clarified by the discovery of a septum in the vagina or cervix. It is seldom possible to palpate the round ligament, but if it is found attached external to the gestation sac the pregnancy is either interstitial or in a horn of a malformed uterus; if the round ligament lies internal to the gestation sac a bicornate pregnancy is excluded.

Diagnosis from Pregnancy in a Rudimentary Horn.—Pregnancy in a rudimentary horn cannot be distinguished from tubal pregnancy before opening the abdominal cavity. It is then recognized by finding the insertion of the round ligament external to the gestation sac.

Diagnosis from Ovarian Tumors.—Ovarian tumors may be difficult to distinguish from an ectopic pregnancy. In ovarian tumors the breasts may enlarge and secrete colostrum, and there may be morning sickness and amenorrhea. With the aid of an anesthetic a bimanual examination should determine the diagnosis. As a rule the uterus can be clearly outlined distinct from the ovarian tumor, and is found not to differ from the normal non-gravid uterus.

Rupture of an ovarian cyst may suggest a possible rupture of an ectopic pregnancy. The absence of a history of pregnancy, the presence of a long-standing tumor, and the absence of changes in the uterus suggestive of pregnancy, including a decidua, should suffice for the making of a diagnosis.

Torsion of the pedicle of an ovarian cyst may give rise to pain and symptoms of internal hemorrhage not unlike those of a ruptured ectopic pregnancy. A consideration of the points referred to under rupture of an ovarian cyst should serve in excluding rupture of an ectopic pregnancy.

An ovarian tumor complicating pregnancy is at times confusing in the diagnosis. The shape, size, and consistency of the uterus, as a rule, serve in determining the presence of a uterine pregnancy. The great improbability of a tubal pregnancy complicating a uterine pregnancy, together with the usual signs of an ovarian cyst, generally clears up

the diagnosis. If the cyst is large it will be observed that there is an absence of ballottement, of fetal heart tones, and of fetal movements in what is suspected of being a gestation sac.

Diagnosis from Fibromyoma of the Uterus.—Fibromyoma of the uterus can scarcely be mistaken for ectopic pregnancy. There is an absence of a history of pregnancy, and the uterus shows none of the characteristic changes. The tumor is of long standing, which together with its firm consistency and the close relation of the uterus to the tumor mass, should leave little doubt as to the diagnosis. An exploratory curettage of the uterus will fail to find decidual tissue.

FIG. 77

Left tubal pregnancy operated on five months after signs of life had disappeared. The superior surface of the left tube is still visible on the surface of the sac. The left ovary was visible only as a bluish flattened patch apparently forming a part of the sac wall. The sac developed between the folds of the mesosalpinx and mesosigmoid. The patient was suffering from uterine hemorrhage, but had never been seriously ill. There had never been signs of rupture, and the whole sac was dissected intact from the cornua of the uterus. (Jewett.)

Diagnosis from Malignant Diseases of the Pelvis.—Malignant disease of the pelvis, by its irregular outline, may suggest an ectopic pregnancy, and the more so when it occurs in the "dodging period." The absence of the signs of pregnancy and the presence of general signs of malignancy should exclude the possiblity of ectopic pregnancy.

Diagnosis from Pelvic Hematoma and Hematocele.—Pelvic hematoma and hematocele not due to ectopic pregnancy are exceedingly rare. Causes other than ectopic pregnancy resulting in the formation of a

hematoma or hematocele are obstructions to the outflow of the menstrual blood, rupture of varicose veins in the broad ligaments, and rupture of an ovarian cyst and of the uterus. In determining the origin of the blood mass the first and most important step is the consideration of pregnancy. In long-standing cases of hematoma and hematocele following upon the rupture of an ectopic pregnancy it may be impossible to find any evidence of pregnancy either in the tube or in the uterus.

Diagnosis from Acute Abdominal Affections.—Of all acute abdominal affections in woman, ruptured ectopic pregnancy is the most important from a gynecological point of view. There are a number of acute affections of the abdominal organs which have very similar clinical manifestations, and it is imperative that a diagnosis be made at the earliest possible moment in order that proper surgical measures may be instituted.

The importance of differentiating these various lesions will justify a thorough consideration. The following acute abdominal affections may simulate ectopic pregnancy:

1. Appendicitis.
2. Intestinal colic.
3. Renal colic.
4. Hepatic colic.
5. Internal hernia.
6. Acute pancreatitis.
7. Movable kidney.
8. Rupture of a gastric or duodenal ulcer.

In differentiating these conditions consideration must be given, first, to the previous history, then to the present complaints, and finally to the physical examination.

Appendicitis.—Appendicitis in its onset and in its further course may very closely simulate a ruptured tubal pregnancy, but in appendicitis there are none of the general and local signs of pregnancy. There is often a history of previous attacks, with intervals of complete or partial freedom from pain and intestinal disorder. The distress is almost always confined to the right side, while in ectopic pregnancy it is often referred to the median line or left side.

In both of these conditions the pain appears suddenly, and may be intense; in ectopic pregnancy it may be momentary, while in appendicitis it usually persists throughout the attack. The sudden pallor and collapse frequently following immediately upon the rupture of a tubal pregnancy never occur in appendicitis. It is at this time that a most suggestive sign appears—*i. e.*, uterine hemorrhage accompanied by a discharge of decidual membrane. In such an event there can be no further consideration of appendicitis. Much dependence is placed upon the finding of an enlarged soft uterus and an irregular mass attached to it at the side or lying behind the uterus. When doubt exists, the uterus may be explored with a curet and the scrapings examined for decidual tissue.

In intraperitoneal hemorrhages from rupture of the gestation sac the abdomen may be distended, firm, and tender, and this may be associated with nausea, vomiting, rise of temperature, and leucocytosis. Here the diagnosis must rely almost wholly upon the previous history.

Intestinal Colic.—Intestinal colic begins with griping abdominal pains, vomiting, and diarrhea. This may lead on to collapse. Often a cause for the intestinal colic can be elicited. Lead colic is rarely seen in women. The blue line on the gums, constipation, and colicky pains about the umbilicus found in a patient working with lead will fix the diagnosis of lead colic.

Renal Colic.—Renal colic should not be difficult to diagnosticate from rupture of an ectopic pregnancy. When occurring during the course of a uterine pregnancy, renal colic may excite suspicion of a ruptured tubal pregnancy. In renal colic the pain is severe and increasing, it is sharp and radiates to the groin and thigh. Vomiting, sudden rise of temperature, cold sweats, and collapse are frequent accompaniments. Watching the urine closely, blood will be seen to appear, though the microscope may be required to detect it. All urine voided should be searched for the stone. These events, in the absence of an extra-uterine pelvic mass, will serve for a diagnosis. A history of previous attacks will be highly suggestive. It is possible that the presence and location of the stone can be determined by means of the *x*-ray.

Hepatic Colic.—Hepatic colic frequently arises after the childbearing period. When associated with pregnancy the rupture of an ectopic pregnancy would naturally be suggested. Flatulent dyspepsia has usually been a more or less constant complaint. Pain is referred to the right hypochondrium, epigastrium, right shoulder, and back. Associated with this is epigastric tenderness, nausea, and vomiting. If the stone passes into the common bile duct there will probably be jaundice, clay-colored stools, and bile in the urine. The gall-bladder may be distended and tender. If gallstones are passed by the bowel or seen by the *x*-ray the diagnosis is established. There is little in such a history to suggest rupture of an ectopic gestation sac, and yet mistakes have been made.

Internal Hernia.—Internal hernia usually begins with pain, which may be severe or slight, and even absent. Vomiting is often the earliest sign, and this becomes stercoraceous. There is no gas or fecal matter passed by the bowel. Indican is present in the urine in large quantities. None of the symptoms points to the pelvis, and a vaginal examination excludes the possibility of ectopic pregnancy.

Acute Pancreatitis.—Acute pancreatitis is frequently regarded as an aggravated form of indigestion until the patient is seized with severe pain in the epigastrium, repeated vomiting, and collapse. The epigastrium is tender on pressure, though there is no distention. Collapse may follow upon persistent vomiting. There is little possibility of mistaking such a condition for ectopic pregnancy, though the abdominal pain, vomiting, and collapse occurring in a woman of the childbearing

period should first of all suggest an abnormal condition of pregnancy and call for an immediate physical examination.

Movable Kidney.—Movable kidney is seldom associated with such intense pain and shock as to become a serious, acute abdominal affection. The pain is usually referred to the right hypochondrium, and may be associated with vomiting and shock. Palpating a firm, tender, kidney-shaped tumor in the right lumbar or iliac space and the ability to readily force this tumor beneath the right costal arch will determine the diagnosis. A history of previous lesser pains and a dragging sensation coming on in the right hypochondrium shortly after rising, together with relief upon lying down, will suggest the diagnosis.

Rupture of Gastric or Duodenal Ulcer.—Rupture of a gastric or duodenal ulcer will almost always occur after a meal and upon exertion. There is a previous history of anemia and indigestion in nearly all cases. The vomiting of blood and the occurrence of gastric pains are frequent events. The history and a pelvic examination will exclude ectopic pregnancy.

Treatment.—Extra-uterine pregnancy is one of the most formidable of surgical emergencies and in the majority of instances calls for early surgical interference in the interest of the mother.

The observations of Werth have an important bearing upon the treatment of extra-uterine pregnancy. He has shown that after the death of the fetus, either before or after the escape of the ovum from the tube, the chorionic epithelium (Langhans' cells and syncytium) may continue to proliferate and to invade maternal bloodvessels in the wall of the tube, thereby inducing hemorrhages. Furthermore, a partial abortion, where the ovum has partly escaped from the fimbriated end of the tube, may occasion repeated hemorrhages as was well illustrated in one of the author's cases. These facts speak for the uncertainty of tentative treatment.

Unruptured Tubal Pregnancy.—The only safe rule to adopt in the interest of the mother is to remove the unruptured gestation sac at the earliest possible moment. When the pregnancy is far advanced, delay may be countenanced in the interest of the child, but only with full understanding of the dangers involved.

As soon as an unruptured tubal pregnancy is recognized, or diagnosticated with a reasonable degree of certainty, the patient must be put to rest and no time lost in the preparations for operation. The question of the advisability of removing the patient to a hospital must be determined by the conditions governing the patient. If the distance is not too great, the means of transportation such as will permit of moving the patient with all possible care and the general resistance of the patient is sufficient for the task, it would seem advisable to convey the patient to a hospital where her interests can be best safeguarded. However, it is best to operate in the home if to move the patient entails great risk.

In the removal of the gestation sac the abdominal route should be chosen.

When the fetus and its membranes are located at the outer end of the tube and can be removed without sacrificing the tube, some authorities have advised conservatism. While such a procedure is theoretically conservative, there is always the question of possible infection and hemorrhage on the one hand and of the leaving of a disabled and offending tube on the other. It is the author's preference to remove the entire tube together with the ovum.

The anatomical findings present so many variations that it is quite impossible to describe a technic which will be of universal application. The general principles are as follows:

A median abdominal incision is made of a length sufficient to deliver the gestation sac and its contents intact; adhesions binding the gestation sac to surrounding structures are broken up, taking care not to break the gestation sac; the tube and its contents are removed *en masse;* all bleeding vessels are firmly secured and the raw surfaces covered with peritoneum. In the absence of sepsis and oozing surfaces the abdomen is closed without drainage. When drainage is established it is best to make an opening through the cul-de-sac of Douglas into the vagina, and through this to carry the end of a roll of antiseptic gauze, leaving the remaining portion of the gauze snugly packed into the space previous'y occupied by the pregnant tube; the abdominal incision is then closed. The drainage is left about forty-eight hours, when it is removed through the vagina. As a precautionary measure against the occurrence of hemorrhage while removing the tube, it is well to ligate or clamp the ovarian vessels near the uterine cornua and between the fimbriated end of the tube and brim of the pelvis. Having secured these vessels the tube or tube and ovary may be removed by excising the uterine end of the tube from the cornua, then with the scissors cutting along the lower circumference of the tube throughout its entire length; thus completely removing the tube from its attachments and leaving the cut edges of the broad ligament to be whipped over with a running suture of No. 1 plain catgut.

The ovary or any part of it should not be sacrificed unless diseased. After the tube is removed, all bleeding points controlled by ligatures and the raw surfaces covered by peritoneum, the surgeon proceeds to correct, as far as possible, all associated lesions in the abdomen. In nearly all instances the position of the uterus must be corrected; this is usually accomplished by looping the round ligaments behind the fundus.

At the Time of Rupture.—When a case is seen at the time of rupture the following questions present themselves: Is immediate operation indicated? Is an immediate operation imperative? Will the patient be in better condition for operation after a variable period of rest and stimulation? These questions can only be determined after carefully considering all conditions pertaining to the physical condition of the patient and the preparedness of the surgeon for operation. The essential principles underlying the solution of the problem are as follows:

As a general proposition all cases seen near the time of rupture or

abortion of the tube call for early but not immediate operation. This is imperative in view of the great dangers of secondary hemorrhage which may prove fatal, and of ill health which often results from too long delay. While it is true that the primary hemorrhage is seldom fatal, it is equally true that there is no possibility of predicting the possible occurrence of secondary hemorrhage, much less the time of its occurrence and the possible consequences. Hence the inadvisability of unnecessary delay after the onset of hemorrhage.

When the patient is found in a state of great depression delay may be countenanced. This the author has done in three instances where a large amount of blood had escaped into the abdominal cavity and the patients were profoundly depressed. No time was lost in making ready for operation, but while the preparations were being made the patients were stimulated and carefully watched. They responded readily to stimulation and were carried safely through the period of depression before the operation was undertaken. Had they not so readily responded they would have been operated upon without delay and without general anesthesia. The author is in accord with Prochownick, who concludes that early operative interference in these cases is the best and most certain form of conservatism. In 50 laparotomies performed by Prochownick good results were obtained in 41, and in 18 vaginal incisions, 12 complete recoveries ensued. Of the cases treated expectantly some were satisfactorily relieved, but the majority failed to attain good health. Out of 39 laparotomies, 21 (53 per cent.) subsequently became pregnant, while in those treated expectantly 50 per cent. became pregnant. In this connection it is of interest to note the advice of Werth, who councils immediate surgical intervention regardless of the degree of shock. He argues that the operation is short, that the anesthetic is given sparingly, if at all, and that he has observed the pulse to improve immediately after these operations.

When the rupture is recent it would seem wise to always choose the abdominal route in preference to the vaginal. By doing this the affected tube can be dealt with and there is a minimum risk of hemorrhage. In one of the author's cases, in which vaginal drainage was established, an intraperitoneal hemorrhage was excited by the manipulations and was all but fatal. In an operation by Schauta, of Vienna, which the author witnessed, the vaginal incision and drainage were hurriedly followed by an abdominal incision for the control of an intraperitoneal hemorrhage.

As soon as the abdomen is opened, if there is no fresh bleeding, the escaped blood is removed with swabs and the tube together with the ovum are removed as described above. If there is fresh hemorrhage at the time of operation there should be no loss of time in controlling the uterine and ovarian arteries with clamp or ligature. The abdominal incision should be long enough to permit of ready access to the field of operation. The escaped blood may mask the condition, and if new blood is being constantly added to that which has escaped, the operator should not attempt to cleanse the field of operation before removing

the tube, but should grasp the uterus with his hand. With this as a starting point he should pass the hand on either side until the pregnant tube is recognized; this is grasped, freed of its adhesions, and pulled into view. A clamp is then placed on either side of the gestation sac to control the ovarian arteries. The escaped blood is then removed with swabs and the operation proceeds as already described.

When there is great depression too much time should not be consumed in the various niceties of the peritoneal toilet and in correcting other conditions within the abdomen.

At the meeting of the American Gynecological Society in 1912 there was a symposium on the management of intra-abdominal hemorrhage in tubal pregnancy. From the discussion the following deductions are presented as an expression of the opinion of the society:

1. Neither undue haste nor yet unnecessary delay should be practised in dealing with these cases, because not more than 5 per cent. die from hemorrhage, and, on the other hand, too long delay in interference may lead to permanent disabilities.

2. An immediate operation does not contribute largely to shock if done skilfully. The added depression as the result of the operation can usually be eliminated by the timely administration of salt solution and other stimulants.

3. The conclusions drawn from a comparison of cases operated immediately with those operated at a much later date are liable to be misleading in that the former group presents a greater number of serious cases.

4. In the hands of the unskilled and when the surroundings are unfavorable to good surgery the deferred operation is preferred, with the exception of the few cases which fail to react under stimulation.

5. No definite rule can be adopted for the management of all cases. It is the business of the surgeon to immediately prepare for operation while restorative measures are being applied. If the patient reacts the operation may be delayed; if she does not react, no time should be lost in opening the abdomen.

After Rupture.—When the case is seen late after rupture the question of tentative treatment may be justly considered. Unquestionably, cases of ruptured tubal pregnancy frequently resolve themselves into a perfectly normal state and may require no surgical intervention. However, it is not possible in any given case to predict such a result with certainty. There is always the possible danger of some untoward event which may jeopardize the life and health of the patient. It is for such reasons that tentative treatment for ruptured tubal pregnancy should not long be entertained, and only so when the patient is under close observation. The dangers arising out of the escaped blood and gestation sac are discussed on page 166.

Management of End Stages.—The management of the end stages of ruptured tubal pregnancy are here briefly outlined:

Formation of a Hematoma.—If a blood mass is found in the pelvis, and the history points to its existence for some time, it is not wise to

council further delay. The likelihood of an indefinite delay in the absorption of the escaped blood, or of the development of a pelvic abscess, or, what is more likely, of the formation of pelvic adhesions, speak for the evacuation of the escaped blood without undue delay.

If the escaped blood can be readily reached through a vaginal incision this route should be preferred to the abdominal.

Vaginal drainage is only applicable to old cases in which there is little danger of exciting fresh hemorrhage.

The disadvantage of vaginal drainage in such cases is apparent. It is not possible to deal carefully with adhesions to coils of bowel nor to be as conservative with the ovary as by the abdominal route, and it is never possible to say with assurance that the placental tissue has wholly escaped from the tube. As long as the chorion remains in the tube there is danger of secondary hemorrhage from the continued growth of the epithelium of the chorion into the bloodvessels of the tube wall. For these reasons some authorities advise operating through the abdomen when infection of the blood mass can be excluded.

Before establishing drainage the position, size, and relation of the hematoma to the pelvic organs must be clearly defined by a bimanual examination under anesthesia. The cervix is grasped with a vulsellum forceps and traction is made by an assistant downward and forward. The posterior wall of the vagina is grasped about one inch from the cervix by a long rat-tooth tissue forceps, and with long sharp-pointed scissors the vaginal wall is incised laterally immediately behind the cervix for a distance of one inch. The index-finger is then inserted into the incision and in the direction of the blood mass. In some instances the finger cannot be forced into the hematoma and long blunt forceps or scissors are directed in advance of the finger. This is a dangerous procedure and should be carried out with great caution. When the clotted blood makes its appearance through the incision the wound is carefully spread with the fingers to permit free drainage. With the fingers or with small swabs the blood-clots are wholly removed. Then follows the packing of the cavity and vagina with a long strip of iodoform gauze. No sutures or ligatures are required. If irrigation of the cavity is made it should be done under low pressure and with sterile normal salt solution at a temperature of 110° to 114° F.

The author has operated upon ten cases in this manner, and in every instance a perfect result was obtained without suppuration. In two of the cases a second and in one a third drainage with irrigation was necessary because of the untimely closure of the incision.

The after-treatment of these cases consists in enjoining rest in bed until such time as the cavity has closed, which rarely exceeds four weeks; of removing the pack forty-eight hours after its insertion, to be followed by an antiseptic vaginal douche; to give such stimulation as may be required, and to nourish the patient in every possible way.

The possible development of adhesions subsequent to the closure of the cavity occupied by the blood must not be disregarded, and when noted they are to be dealt with by the application of hot vaginal

douches, glycerin and ichthyol tampons, and pelvic massage according to the principles laid down. See Chapter XI.

Suppuration.—When the escaped blood becomes converted into an abscess no time should be lost in draining the abscess through the vagina.

The author recently performed an operation in which not only a pelvic abscess developed out of a ruptured tubal pregnancy, but a general suppurative peritonitis followed.

After draining such a pelvic abscess, great caution must be exercised in all the manipulations for fear of breaking down the protective wall of adhesions which safeguards the general peritoneal cavity. Too vigorous manipulations with swabs, fingers and instruments within the abscess cavity have been responsible for the development of general peritonitis. The irrigation of the abscess cavity at the time of the operation should also be condemned for the same reason.

After the abscess has been drained it is the author's custom to pack the cavity and the vagina with a single long strip of iodoform gauze. These strips are usually removed thirty-six to forty-eight hours after the operation and a vaginal douche of formalin, 1 to 4000, given at low pressure. Subsequently, if the drainage is not good, as evidenced by increased pain in the pelvis, rise of pulse-rate and temperature, the original incision may be spread with forceps or fingers, and the cavity irrigated with sterile normal salt solution. If an accumulation of pus is detected in the pelvis which will empty by this method alone, it should be opened by the finger or by advancing forceps, and possibly again packed with gauze.

There should be no thought of opening the abdominal cavity so long as the pus is confined to the pelvis and can be drained through the vagina. There is time enough for an abdominal section after the pus is well drained, and the acute stage of the pelvic inflammation has long passed. Happily, in many cases there is no need of a subsequent abdominal section.

Secondary Hemorrhage.—When there has been a secondary hemorrhage no time should be lost in performing an abdominal section. Vaginal incision is not countenanced in view of the possibility of having to contend with an uncontrollable hemorrhage. Delay in interfering is likewise inadvisable, for it is assumed that a third and possible fatal hemorrhage may ensue.

Growth of Fetus after Rupture.—If the escaped mass of blood and ovum slowly increases in size and it is thought highly probable that the fetus is living, the proper procedure is to open the abdominal cavity and remove the tube and escaped mass. In exceptional cases it may be demonstrated by the examination that the ovum lies within the broad ligament. In such an event a vaginal section would be the method of choice. The precaution, however, should be taken to prepare previously for an abdominal section in view of possible failure to complete the operation through a vaginal incision.

While the vaginal route has been chosen for the removal of advanced

extra-uterine gestation the difficulties are great and should only be chosen in preference to the abdominal route when there is suppuration.

Treatment of Intraligamentary Extra-uterine Pregnancy. — When the diagnosis is made in advance of the operation an extraperitoneal route should be chosen; this should be by the vagina or immediately above Poupart's ligament, depending upon the location of the gestation sac. If the sac is located low in the pelvis the vaginal route is chosen, if high upon the anterior wall, the incision should be made immediately above Poupart's ligament. Unless far advanced in pregnancy one of these routes should be chosen even after an abdominal incision has been made and the gestation found lying extraperitoneal.

Treatment of Interstitial Pregnancy.—Kelly advises the making of a gentle effort to open the sac wall into the uterine cavity by dilating the cervix and using a sound. Such a procedure would seem to be very uncertain and hazardous.

The difficulties involved in accurately locating the gestation sac in the horn of the uterus before making an abdominal incision are great, and it would seem to the author that in view of the opportunities for infection the greatest safety lies in favor of excising the gestation sac and tube from the uterus through an abdominal incision.

Treatment of Advanced Extra-uterine Pregnancy.—No consideration should be given the child prior to the period of viability. The dangers attending the presence of a living fetus within the abdomen, but not resident in the uterus, are of such a serious nature as to brook no delay in its removal.

After the period of viability the question may justly arise as to the advisability of allowing pregnancy to advance to near term in the interest of the child. The author very much questions the wisdom of such a course. A living and well-developed child is occasionally delivered through the abdomen, but such instances are very rare. It is far more likely that the mother's life will be jeopardized in the effort, or that the life of the child will not be saved. Too often such babies are poorly developed and survive for only a short time.

At all events, if such an expectant course is to be pursued in the latter half of pregnancy, it should be by the expressed wish of the mother and friends after a full understanding of the attending dangers. Throughout this period of watchful expectancy the patient must always be under masterly control, with conditions such as will permit of immediate surgical intervention should occasion arise.

When the ectopic pregnancy is advanced into the second semester it is of the highest importance to determine the life or death of the fetus. Upon this decision will depend the disposition that will be made of the placenta. If the fetus is living the removal of the placenta together with the fetus becomes a dangerous procedure, because of the accompanying hemorrhage. In the presence of a dead fetus the placental sinuses are plugged with coagula and no serious hemorrhage is anticipated in its removal. In the majority of cases the life or death of the fetus is not determined before opening the abdomen.

If the fetus is dead it should be removed together with the placenta. If the fetus is living and the placenta is so attached to the uterus, broad ligaments or tubal wall that the bloodvessels leading to the placenta may be securely ligated, the placenta may be removed along with the fetus. If not so attached the cord is ligated and severed close to the placenta, the fetus removed, and an iodoform gauze pack carried down upon the placenta. This gauze pack is removed at the end of forty-eight hours and the placenta left to be discharged piecemeal through the wound or removed *en masse* at the end of the forty-eight hours.

In such cases there is always the danger of hemorrhage from the placental site, and the infection of the placental mass prolongs the convalescence and may lead to a fatal issue. Whenever possible it is a wise precaution to ligate the ovarian and uterine vessels on the affected side. The greatest care must be exercised in securing by ligatures all bleeding vessels and in maintaining the strictest precautions against infection.

As far as possible the general peritoneal cavity must be protected against possible contamination. This is done by walling off the peritoneal cavity with sterile packs of gauze while the operation is in progress, and when the placenta is left, by stitching the amniotic sac to the peritoneum of the abdominal incision.

Because of the great danger of secondary hemorrhage and sepsis it would be hazardous to close the abdominal incision after removing the fetus, leaving the placenta to be absorbed.

If extensive adhesions exist they are carefully separated, and if the raw surfaces cannot be well covered with peritoneum or thoroughly charred with a thermocautery it may be well to establish drainage. This is best done by carrying the end of a long strip of iodoform gauze through the cul-de-sac into the vagina and packing the pelvis.

Treatment of Combined Extra-uterine and Intra-uterine Pregnancy.—Many cases have been reported in which a lithopedeon of long standing has remained in the peritoneal cavity without disturbing subsequent uterine pregnancies. They have been known, however, to necessitate the induction of abortion and to obstruct labor at full term.

When the tubal pregnancy is active at the time of uterine pregnancy the indication for interference is imperative. While an effort should be made to save the child *in utero,* the presence of a tubal pregnancy brooks no delay.

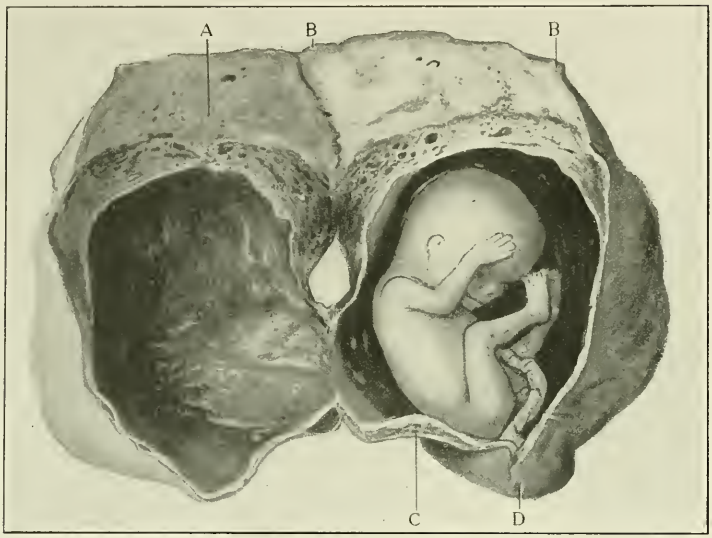
The rule is to deal with the tubal pregnancy along the lines already laid down and to prevent, if possible, the interruption of the uterine pregnancy. It is always hazardous to attempt an immediate delivery of the fetus *in utero.*

Treatment of Ovarian Pregnancy.—This does not differ essentially from that of tubal pregnancy.

Treatment of Pregnancy in a Rudimentary Horn of the Uterus.—The operation does not differ essentially from that described for tubal

pregnancy. As a rule the rudimentary horn has a well-marked pedicle which is dealt with as is the uterine end of the tube.

FIG. 78



A case of ovarian pregnancy. *A*, stroma of ovary; *B*, cut edge of attachment; *C*, placental tissue; *D*, seat of rupture. (Banks, in Jour. of Obst. and Gyn. of British Empire, April, 1912.)

Mortality of Extra-uterine Pregnancy.—In 22 cases of tubal pregnancy the author has had 2 fatalities; 1 a ruptured tubal pregnancy which was not seen until a general suppurative peritonitis had developed, and an intraligamentary pregnancy ruptured into the general peritoneal cavity with the escape of a large amount of blood. Death resulted from surgical shock. The 20 cases which recovered were of the following varieties: early unruptured tubal pregnancies, 4; early tubal abortions, 3; early intraperitoneal ruptures, 7; early intraligamentary ruptures of the pregnant tube, 6.

In all the cases both the tube and the gestation sac were removed. The ovary of the affected side was saved in more than half the cases.

Schauta reported 241 cases not operated in which there was a mortality of 68.8 per cent.

In the Johns Hopkins Hospital there were 139 cases reported by Kelly, of which 6 died.

It will be of interest to note a comparison of the results in the conservative and radical methods of treatment of extra-uterine pregnancy.

Von Scanzoni treated 56 cases of early rupture of the tube by the expectant treatment and operated in 63 additional cases. Those treated

expectantly were dismissed on an average of fourteen days earlier than were those on whom a laparotomy was performed.

It must be borne in mind that the depression in these cases was not as great as it was in those on whom laparotomies were performed, and hence the period of convalescence would naturally not be so long. It must also be borne in mind that Scanzoni has not taken into account the disabilities that accrue from unremoved pelvic hematomas, meaning by them principally the adhesions which commonly develop in and about the site of a hematoma.

Prochownick argues for early operative interference in all of these cases. He affirms that the majority of his cases treated on the expectant plan kept on ailing, whereas those on whom an abdominal or vaginal section was performed gave better remote results. In 50 laparotomies 41 gave good results and in 18 vaginal incisions 12 made good recoveries.

The following statistics speak for the good results in operated cases of ruptured tubal pregnancy with encapsulated escaped blood:

Schauta	82	2 deaths
Küstner	72	1 death
Fehling	130	3 deaths
Krönig	63	0 death
Total	347	6

Formad, formerly coroner's physician in Philadelphia, found hemorrhage due to ruptured tubal pregnancy the cause of death 35 times in 3500 autopsies.

CHAPTER X

CHORIOEPITHELIOMA MALIGNUM

Etiology
Clinical Diagnosis
Macroscopic Appearance
Microscopic Appearance
Malignant Degeneration of Hydatiform Mole
Primary Chorioepithelioma Outside of the Placental Tissue
Histogenesis
Diagnosis
Treatment

From the fact that the histogenesis of this newgrowth has, until recently, been little understood, a number of names have been assigned to it. It was called deciduoma malignum, because it was believed to be a malignant proliferation of the decidua. Sarcomachoriocellulare was a name suggested, on the theory that the essential cell structures were of mesoblastic origin. On the other hand, the name carcinoma syncytiale was proposed, because of the supposed epithelial character of the growth. The term chorioepithelioma malignum more accurately expresses the true histogenesis of the growth, for it is now generally conceded that the growth is derived from the epithelial elements of the chorion and not from the decidua. (See Plate XII.)

This tumor formation was first described by Sänger, in 1888, before the Obstetrical Society of Leipzig. Sänger believed the growth to be a malignant proliferation of the decidua, and classified it as a sarcoma. L. Fraenkel was first to demonstrate the origin of the growth in the epithelium of the chorion. He classified the tumor as a carcinoma. The present knowledge of the histogenesis and histology of chorioepithelioma malignum is largely due to Marchand's important work on this subject. He demonstrated that both the syncytium and Langhans' cells take part in the formation of the newgrowth, and hence the fetal origin of the tumor, though occupying maternal tissues.

Peters demonstrated the true genesis of the epithelial layers of the chorion, Langhans' layer, and syncytium in his observations on an ovum estimated to be five to six days old. He has demonstrated to the satisfaction of most observers that both the syncytium and Langhans' layers are derived from the ectoderm or trophoblast and that they are histogenetically identical. Holding to this view of the histogenesis of Langhans' layer and the syncytium a more intelligent discussion of the histology of the growth is possible.

Etiology.—In the author's analysis of 210 cases of hydatiform mole, he found that 16 per cent. became malignant. It is stated that from 40 to 53 per cent. of chorioepithelioma malignum cases follow the expulsion of a hydatiform mole, 25 to 35 per cent. follow upon abortions, and 20 to 25 per cent. follow upon full-term labors. Briguel collected

Primary Chorioepithelioma Malignum in the Uterine Musculature.

181 cases of syncytioma malignum, in which 46 were preceded by normal labors, 55 by abortion, 76 by hydatid mole, and 4 by tubal pregnancy. Tubal pregnancy has given rise to chorioepithelioma malignum in 13 reported cases. All were fatal save the one reported by Albert. It is seen that hydatid mole is particularly likely to undergo malignant degeneration. The time a hydatiform mole remains *in utero* has no influence upon the development of a malignant growth; there is the same liability to malignant transformation in the early as in the later moles.

In 124 cases collected by Ladinski the average age of the patients was thirty-two years—the extreme ages seventeen and fifty-five years. The greatest number occurred between twenty-seven and thirty-three years of age. In 90 cases collected by the same author the average number of children born was 4.2. The time of the development of the growth in the placental site in relation to the expulsion of a hydatid mole, an abortion, or a full-term labor is two weeks to four and a half years.

Clinical Diagnosis.—The diagnosis must be based upon both clinical and histological investigations. There is almost invariably a history of pregnancy and the expulsion of a hydatiform mole, an undeveloped fetus, or a full-term fetus, weeks, months, and even years before the appearance of a malignant growth.

The earliest symptom is hemorrhage. The loss of blood increases in amount and frequency, and very early causes profound anemia. The usual means employed to check hemorrhage fail utterly, and may increase the flow. Persistent hemorrhage following upon an abortion or hydatid mole is suggestive of syncytioma. In curettage, the procedure must sometimes be abandoned because of the alarming hemorrhage.

A dirty, watery discharge occurs, together with and in the intervals between hemorrhages. Later this discharge assumes a foul odor.

Pain is not a notable symptom. When present it is usually referred to the thighs and sacral region.

Cachexia is an early development, following closely upon anemia. Loss of weight and strength is extreme.

Symptoms referable to metastasis are early present—so early as to be characteristic of the disease. In order of frequency metastatic growths are found in the lungs, vagina, liver, spleen, kidneys, ovaries, intestines, brain, broad ligament, pleura, lymphatic glands, pancreas, heart, stomach, and lymph glands of the pelvis. It is unusual for the metastatic growths to spread by way of the lymph glands, as is common with carcinoma. The cellular elements are, as a rule, conveyed by the blood stream, and in this respect behave like a sarcoma.

Fever of a low grade is commonly present, and may reach 104° F. The pulse is correspondingly rapid and feeble.

These clinical signs are very significant, but alone they are not sufficient. The macroscopic and microscopic features of the growth must be considered before a diagnosis can be made with certainty.

Macroscopic Appearance.—The macroscopic appearances of the growth are generally characteristic. The uterus is almost always enlarged, and is commonly described as soft. In advanced cases there may be irregularities on the outer surface as well as on the inner. The cervix is usually patulous to the index finger, and in the cavity of the uterus may be felt a soft, brain-like mass, friable, and bleeding profusely when handled. To the naked eye this soft mass resembles at times placental tissue, and at other times a vascular sarcoma. The color of the growth is mottled red, varying from a bright to a dark shade. Necrosis early develops. The primary growth is not always confined to the uterus. Cases have been recorded in which the uterus remained free and a chorioepithelioma malignum developed in the vagina, lung, kidney, liver, brain, and spleen. (*Vide infra.*)

Microscopic Appearance.—The microscope is indispensable in determining the true character of the growth. Under the microscope a rapidly proliferating structure is recognized. It is composed of syncytium and Langhans' cells, which invade the uterine tissue in a most typical manner, and are early conveyed to distant portions of the body by way of the blood-stream.

After the expulsion of a hydatid mole the uterus should be explored by the finger to detect and remove any retained placental tissue. Two weeks later the uterus should be curetted and the scrapings examined microscopically. If Langhans' cells and the syncytium are found to be proliferating in the decidua, the uterus should be removed without delay. In every abortion or full-time labor, when an unaccountable hemorrhage follows weeks and months afterward, an exploratory curettage should be done, in view of the possible finding of malignant placental tissue.

The microscopic picture is that of strands of protoplasmic masses, with nuclei and vacuoles forming a reticular structure. Polynuclear giant cells of syncytium are found in the network.

The histological character of these growths differs widely. Two chief classes are recognized by Marchand: The typical and atypical.

Typical Form.—The typical form assumes the character of the chorionic epithelium in the early placenta, in that it presents a prolific growth of syncytium in a more or less established manner, together with a rather definite proportion of Langhans' cells. Not only may the epithelial elements be present in fairly definite proportions, but the entire villus, composed as it is of stroma and overlying epithelium, may be found in the tumor growth. In short, there are found in the chorioepitheliomatous growths all the elements of the placenta which are found in the early stages of pregnancy, and the arrangement of these elements is not unlike that of the normal placenta.

Atypical Form.—The atypical form presents a remarkable variation in its cellular structure and in the arrangement of its cells. The general arrangement of the elements in the normal placenta is lacking. The shapes of the individual cells alone suggest placental tissue, and in this there are great variations. Some have been composed wholly of

syncytium, others wholly of Langhans' cells. There is such variation in structure that at times it is impossible to distinguish Langhans' cells from syncytium.

A feature worthy of special remark is the large quantity of blood in the primary and secondary growths. The blood lies between the cell elements and bathes them as in the case of the normal placenta, only here an exaggerated condition is found. A further analogy between the chorioepitheliomatous growths and the normal placenta is the peculiar relation between the epithelial cells and blood fibrin. In both conditions fibrin layers are found between individual cells and groups of cells. The syncytial cells penetrate vessel walls, blood is liberated, and, as a consequence, thrombi are formed in the bloodvessels, and there is a hemorrhagic infiltration of surrounding tissues with the formation of fibrin. Fresh hemorrhages add to the mass by extending the blood-spaces, and in this manner the rapid growth of the tumor is explained. The metastatic growths resemble the primary tumor.

FIG. 79

Cystic degeneration of the villus, with an islet of syncytium within the degenerated stroma.

Malignant Degeneration of Hydatiform Mole.—The greatest interest in hydatiform moles centres in the fact that they are likely to undergo malignant degeneration. Solowij and Korzysz-Kowski have shown that about 10 per cent. of hydatiform moles become malignant. On the other hand it is generally recognized that fully 40 per cent. of the cases of syncytioma malignum arise from hydatiform mole. In collecting reported cases of hydatiform mole the author found a scarcity of case reports of non-complicated hydatiform mole, and that cases are seldom reported unless they have undergone malignant degeneration. For this reason it is impossible to arrive at any exact estimate of the frequency of hydatiform moles and of their malignant degeneration. According to the reported cases, which include all the author was able to find in the literature, it appears that 16 per cent. of hydatiform moles become malignant. It is probable that this percentage is far too high.

From the very onset the difficulties involved in dealing with the many mooted questions concerning the malignancy of hydatiform

mole appear insurmountable. The intimate blending of fetal and maternal structures, together with the secondary processes of degeneration, are so complicated and so subject to variations that it is difficult and at times impossible to distinguish the benign from the malignant. Indeed, Van der Hoeven goes so far as to state that all hydatiform moles are malignant; that the proliferation of the epithelial elements of the chorion (syncytium, Langhans) assumes a malignant type in the invasion of the uterine musculature and connective-tissue stroma of the villi. He further reasons that if this tendency on the part of the epithelial elements to proliferate is not marked, or if the mole is expelled or removed before the epithelium invades the uterine tissue beneath the line of cleavage (within the compact layer of the decidua), there can be no recurrence. If left behind in the uterine tissue, the epithelial elements continue to proliferate and to be carried to distant parts of the body by way of the blood stream, there forming metastatic malignant epithelial growths.

Fig. 80

Beginning degeneration of the stroma, with unusual proliferation of the syncytium.

Neumann studied 8 cases of hydatiform mole; 5 were not followed by malignant changes, 3 died of syncytioma malignum. In the 5 so-called benign moles the epithelium of the chorion proliferated to an unusual degree, but did not invade the connective tissue of the stroma, while in the 3 malignant moles the connective-tissue stroma was invaded by syncytial giant cells. Neumann arrived at the conclusion that the earliest evidence of malignancy lay in the invasion of the connective-tissue stroma of the villi by the epithelial elements of the chorion. As suggested by Pierce, the "view of Neumann is not generally recognized, and with right, for cases of nephritis and lead poisoning have since been described in which the same cells were found in the stroma of normal villi; hence their presence can have no pathological significance in hydatiform mole."

It is evident from the observations of Veit, Webster, Pick, and

others, that the invasion of the deep structures of the uterus, and even of structures beyond the uterus, by chorionic epithelium, is not evidence *per se* of malignancy; that, on the contrary, syncytial masses are found in the uterine musculature, and are deported to distant parts of the body by veins in normal pregnancy; that soon after the termination of pregnancy they are no longer found. The transition between benign and malignant chorioepithelial elements is gradual and imperceptible, just as is the transition of all benign hyperplastic growths into the malignant types. To differentiate them is manifestly impossible. There undoubtedly exists an intermediate stage between the benign and malignant. Berry Hart examined a hydatiform mole in which the epithelial changes were identical with those described in the malignant type; no recurrence followed the expulsion of the mole. Both the syncytium and Langhans' cells participate in the proliferative changes, but to a varying degree. There is, likewise, great variation in the rate of growth in the epithelial elements, the explanation not only lying inherent within the cell elements, but also in the degree of resistance offered by the uterine tissue.

Two of the cases described by Kworostansky were in the second month of pregnancy—one was a benign hydatiform mole, the other a syncytioma malignum. It is of the greatest interest to compare these two cases from an anatomical point of view. In the benign mole there was unusual proliferation of the syncytium and Langhans' layer, forming a loose connection with the decidua serotina; in the veins of the serotina, both syncytial and Langhans' cells were found in limited numbers. The decidua vera was invaded to a lesser degree; no epithelial elements were found in the uterine musculature. In the placental site were evidences of endometritis, as demonstrated in scrapings removed six weeks after the expulsion of the mole. The case recovered without recurrence. The author states that the patient, aged twenty-four years, was anemic, and that this impoverishment of the blood afforded insufficient nourishment to the villi, thereby exciting the chorionic epithelium to extend deeper into the uterine musculature in order to obtain greater nourishment. Sufficient nourishment not being provided by the stroma of the villi, necrosis follows. In the second case, which was malignant, there was also extreme anemia. The epithelial elements behaved like those of the first case, only to an exaggerated degree, apparently differing only in the degree of epithelial invasion of uterine structures. The syncytial cells invaded the intermuscular spaces and veins of the uterus as far as the parametrium. Atrophy and necrosis of the decidual and muscular elements followed; blood-vessels were changed to blood-lacunæ. In comparing my specimen of benign hydatiform mole with one having undergone malignant changes, it was advisable to select for comparison not only one of similar age, but also one that had been removed together with the uterus, as was mine. In this way certain retrogressive changes and the disturbance of anatomical relations which would otherwise mislead can be avoided. Two such cases have been reported—one by Boten and Vassmer, the

other by Neumann. In both these cases the essential variations from my own case appear to lie in the more marked proliferation of the syncytium and Langhans' cells and in their extended invasion of the uterine veins and musculature. While it is not to be expected that a benign mole may be distinguished from a malignant mole by the naked eye, yet it is worth while to observe that Pautz and others have found in malignant moles that the villi rarely attain large size, are firm, and have a long, slender pedicle, giving to the mole the appearance of soft-cooked rice.

FIG. 81

Showing syncytial invasion of the stroma.

Ladinski, in a clinical review of deciduoma malignum, reported a case of hydatiform mole followed by malignant degeneration. He collected thirty-three similar cases, and concluded that malignant degeneration occurred most frequently in cases in which mole pregnancy terminated in the fourth month. It does not appear that the length of time a mole remains *in utero* has any influence upon its disposition to become malignant. In twenty cases Ladinski finds the average time of appearance of syncytioma malignum is eight weeks after the mole has been expelled.

An early diagnosis of hydatiform mole is of importance because of the liability to malignant degeneration. While, as a rule, there will be the usual clinical signs of a mole some time before malignant changes develop, there is always the possibility of early malignant transformation, and it is not possible to detect these early malignant changes.

The only safeguard lies in the early recognition of the mole and in its immediate removal.

Will the microscope supply an infallible means of making an early diagnosis of malignant degeneration of a mole? Van der Hoeven and Neumann's statements that epithelial invasion of the stroma of the villi is the earliest and at all times reliable evidence of malignancy cannot be accepted. Such findings are not uncommon in normal pregnancy. Marchand failed to find the stroma invaded in a malignant mole, and Ruge found such invasion in an undoubted benign mole. In my second case there was epithelial invasion of the stroma of the villi. Ten years have elapsed since the removal of the mole, and no signs of malignancy have developed.

In a case reported by Poten the mole went on to the time of full-term pregnancy. Neumann's cells were found in the stroma of the villi. On the twenty-sixth day after the mole was expelled, hemorrhage recurred to a slight degree. The uterus was curetted, and a microscopic

FIG. 82

Giant syncytial cells showing vacuoles.

examination of the scrapings showed no evidence of malignant invasion; recovery followed. This case shows how difficult, and at times impossible, it is to determine the character of a hydatiform mole. *In the light of present knowledge a guarded diagnosis must always be made in the early stage; and at no time can a diagnosis be made with absolute certainty from the appearance of the expelled mole.* The invaded decidua, and if possible the underlying musculature, will alone afford evidences of malignant invasion prior to the development of metastasis. In the case reported by Schmidt a diagnosis of malignancy was first made from a microscopic examination of a metastatic growth which appeared in the vagina. The uterus was not removed, and recovery followed the removal of the vaginal growth. When hemorrhage recurs days or weeks after complete removal of the mole, the uterus should be curetted and the scrapings examined for active and extensive invasion

of the uterine tissues. Large nuclei, rich in chromatin and mitotic figures, together with a tendency on the part of the protoplasm to separate into individual cells or chains of cells, are, according to Voigt and Gottschalk, suggestive of malignancy.

There is as yet no certain means of making an absolute and early diagnosis of malignant degeneration of a hydatiform mole. The clinical signs, together with the gross and microscopic appearances, are all to be carefully considered. In view of the inability to make an absolute early diagnosis, vesicular degeneration of the chorion, however limited, demands immediate interference, to be followed by a period of at least three years of watchful expectancy. If at any time following the expulsion of the mole, hemorrhage recurs, the uterus should be curetted and a microscopic examination made of the scrapings.

Prognosis.—Experience teaches that all cases must be looked upon with suspicion even months and years after the removal of the mole. It is seldom that serious consequences occur while the mole is *in utero*. Malignant degeneration, rupture of the uterus, fatal hemorrhage—all these have occurred with the mole *in situ*, though such happenings are, fortunately, rare. Remote results, *i. e.*, a repetition in subsequent pregnancies and malignant degeneration of retained chorionic epithelium, are to be feared. Heitzman estimated the mortality at 13 per cent. These statistics were gathered at a time when chorioepithelioma malignum was not recognized. It is generally accepted that 10 per cent. of hydatiform moles undergo malignant degeneration, and this estimate also approximately expresses the death-rate of hydatiform mole; but it is far too small, as shown by the following data. Deaths from hemorrhage and, to a lesser degree, from septic infection and rupture of the uterus add materially to the death rate, bringing the mortality to near 25 per cent.

In the author's 210 cases collected from the literature there were 49 deaths—a mortality of about 25 per cent. Of this number 32 died from syncytioma malignum (16 per cent.); 7 died from hemorrhage (4 per cent.); 4 died from septic peritonitis (2 per cent.); 1 died from general sepsis; 1 from uremia; 1 from endocarditis and nephritis; 1 from meningitis, and 2 from unknown causes. The author does not regard these statistics as expressing actual facts. There is doubtless a tendency to report all cases resulting fatally and to overlook those having no special point of interest in their course and termination.

The later in pregnancy we have to do with vesicular degeneration of the chorion the more grave the prognosis, because of the difficulty in removing the mole and the greater likelihood of rupture of the uterus and of malignant degeneration. It has been stated, and will bear repetition, that the removal of a hydatiform mole is imperative as soon as the diagnosis is established. There can be no temporizing, however limited the vesicular degeneration and however early or late the condition is recognized.

Primary Chorioepithelioma Malignum Outside of the Placental Site.—In the 21 cases collected by the author unmistakable chorioepithe-

liomatous tumors have been observed in locations remote from the placental site of the uterus and Fallopian tubes. In no case has it been possible to trace a direct anatomical connection between the placental site and the primary tumor.

In nearly all cases it has been possible to trace a direct clinical relation between pregnancy and the tumor formation. These tumors have arisen during the course of pregnancy, at varying intervals after the completion of normal pregnancy, following complete and incomplete abortions, while hydatiform moles were *in situ* and at variable times after their expulsion. In no instance has such a growth been recognized in a nullipara, though in one instance the appearance of the tumor followed the establishment of the menopause.

In primary chorioepithelioma of the placental site the vagina is most often the seat of secondary invasion by metastasis. It is also true that primary extra-uterine chorioepithelioma arises with greatest frequency in the vaginal walls. This is an exception to the rule that tissues which are a common seat of primary malignant growths are seldom a seat of secondary invasion by these growths. The following presents the topographical distribution of the chorioepitheliomata in regions not connected with the placental site: vagina, 14; lungs, 8; liver, 5; brain, 5; kidney, 5; uterine musculature, 3; intestine, 3, and 1 each in spleen, thyroid, suprarenal gland, retroperitoneal lymph gland, heart muscle, ovary, bladder, labium, and mediastinum.

It was not always possible to identify the primary growth apart from the secondary metastatic growths. The vagina was believed to be the primary seat in 11 cases; the uterine musculature in 3 cases; the cervix, brain, kidney, and labium each in 1 case. In the remaining 3 cases it was not possible to identify the primary growths. The size was not found to be a safe guide in judging the priority of the growth. For example, in the case reported by Fiedler the primary growth in the uterine musculature was the size of a cherry-stone, while in the liver there was a secondary growth the size of a child's head.

Undoubtedly small metastatic growths in various portions of the body are frequently overlooked, and subsequently disappear spontaneously. They are known to vary in size from that of a hazelnut to a child's head, and in number from one to a score or more. Multiple growths in the same organ or tissue have been repeatedly described, and in all cases there was an almost uniform appearance in the gross structure. In general, they have presented the macroscopic appearance of blood-clots. As a rule they were of firm consistency, bluish red in color, and on cross-section presented a fibrinous-like character in the centre of the blood-coagulum.

In the vagina the overlying mucosa was frequently ulcerated, and through the defective covering blood escaped. Occasionally the hemorrhage was so great as to require tamponing or immediate operation.

In all cases of primary vaginal growths the hemorrhage was at first thought to come from the uterus, but direct inspection readily located the seat of hemorrhage in the vaginal tumor, and a subsequent

exploratory curettage, with microscopic examination of scrapings, excluded the presence of the growth in the uterus.

Histogenesis.—It is interesting to speculate on the genesis of these growths. Was the placental tissue malignant when *in utero*, and had metastatic invasion been instituted prior to a complete expulsion of the malignant placental tissue from the uterus? Is it possible to conceive of a complete spontaneous expulsion of malignant placental tissue from the uterus—*i. e.*, self-elimination of the original uterine tumor while the metastatic growths remain in distant portions of the body and continue to develop? Is spontaneous involution of the original uterine tumor possible? Is it possible that the primary growth at the placental site was removed by the curet or finger? These are interesting and important questions, which future investigation must answer.

It has been shown conclusively by Webster, Veit, Pick, and later observers that not only chorionic epithelium, but the entire villus as well is carried to distant parts of the body through the blood-stream, and this under perfectly normal conditions.

May these deported elements proliferate to form tumor growths which may be benign in one case, malignant in another, and leave the uterus free from tumor formation?

With our present knowledge of the placenta these problems cannot be solved. Macroscopic and microscopic examinations of the expelled placenta of hydatiform mole and of scrapings from the placental site afford no information, because it is impossible to distinquish a malignant from a benign growth of the epithelial elements found in these structures.

Neumann's statement that malignancy is recognized by the epithelial invasion of the stroma of the villus has been disproved.

The atypical growth of syncytium with large and richly chromatic nuclei has been regarded by Gottschalk and others as indicative of malignancy; but this, too, has been disproved.

The proliferation of Langhans' cells and their atypical distribution were thought by Voight to suggest malignancy, but subsequent investigations fail to substantiate his views.

Primary chorioepitheliomatous growths outside of the placental site have developed where macroscopic examinations of the expelled mole or placenta showed none of these features (Pick, Guerard).

The fact that syncytium under normal conditions is known to disappear spontaneously from uterine and other tissues leaves the question open as to the possibility of malignant chorioepithelioma spontaneously disappearing from the uterus.

Under perfectly normal conditions the syncytium proliferates rapidly, destroying tissues as it advances, burrowing into bloodvessels, and is carried to distant portions of the body. So far as it is at present possible to judge, the difference in the behavior of normal syncytium and the malignant type is one of degree in its proliferating tendencies. It is probable, as Risel has suggested, that the difference between the benign and the malignant syncytial growth does not lie in these elements,

but is dependent upon the peculiar resistance of the tissues invaded. Every possible gradation is found between the normal placenta, the hydatiform mole, and chorioepithelioma malignum, and a transition from one to the other in the order named is possible.

Permanent healing has followed the removal of the growths, and even the partial removal, as in the case of Fleischmann, in which a secondary vaginal tumor was removed, together with only a portion of the primary uterine tumor. Not only did the uterine tumor completely disappear, but there was subsequent childbearing and complete recovery.

The microscopic examination of the tissues scraped from the uterus showed what appeared to be a typical chorioepithelioma malignum.

The only conclusion to be drawn is that there is no way of judging the malignancy of these growths save by the subsequent course of the case.

Schlagenhaufer and, at about the same time, but independently, Wlassow observed chorioepitheliomatous growths in the testicle identical to those found in the female. These growths are regarded by the observers to have the same histogenesis—*i. e.*, they arise from embryonic elements of the fetal ectoderm and contain both syncytium and Langhans' cells. Wlassow examined twelve teratomata of the testicles and found this peculiar cell structure in three. L. Pick has since found a similar structure in ovarian tissue. Risel, Schmorl, and Steinhaus have made further observations in cases of chorioepithelioma malignum of the testicle. It is possible, though not yet proved, that such tumors may occur elsewhere in the male. Breus (1878) recorded a testicular tumor, with a secondary tumor in the heart, which Schlagenhaufer regarded as a malignant hydatiform mole in the male, and Breus later accepted his views as highly probable.

It is probable that in the antenatal period, when the fetus is little more than a segmentation sphere, one or more polar bodies or blastomeres become displaced and incorporated in the structures which go to make the testicle, and later develop into structures comprising all three layers of the blastoderm.

Why a complete embryo is not developed and why the growth at times becomes malignant are unsolved problems.

Diagnosis.—From a study of reported cases it is observed that the clinical diagnosis of primary chorioepithelioma has only been made in the cases in which the lesion could be directly inspected—*i. e.*, in the vagina, labium, and cervix. They were recognized by their characteristic rounded shape and bluish color, their tendency to bleed freely, and by the absence of uterine hemorrhage, together with negative findings in the uterus, after exploring with the finger and curet.

The clinical diagnosis was at all times confirmed by microscopic examinations of portions of excised or curetted tissue. Without the microscope a positive diagnosis is not possible.

Tumors lying in hidden portions of the body—*e. g.*, kidney, liver,

and lung—were not diagnosticated with certainty without a post-mortem examination.

When the case did not end fatally it was not possible to say that the growth was malignant, from the fact that the macroscopic and microscopic findings in these growths were in no way diagnostic of malignancy.

The ages at time of operation were twenty to fifty years. Twelve of the seventeen cases in which the age was recorded occurred between thirty-five and forty-one years of age.

Among these there is one case in which a hydatiform mole was *in utero* at the time of the appearance of the symptoms and primary growth. In another case there was a two months' fetus *in utero*. In three cases the tumor followed incomplete abortions; in three others the abortions were complete, and seven cases had had normal labors.

In all cases in which there were vaginal or cervical tumors, hemorrhage was the symptom which led to the detection of the growth. In exceptional cases a foul-smelling vaginal discharge followed the appearance of the hemorrhage.

From the fact that these growths are so frequently located in the vagina, and that hemorrhage is an early and constant symptom, suspicion should always be aroused by the occurrence of bleeding from the vagina during the course of pregnancy after the expulsion of a hydatiform mole, an abortion, or labor.

If on inspection such a tumor is found it should be excised, and if on microscopic examination chorionic epithelium is found an exploratory curettage of the uterus should be made. The microscopic findings in the scrapings, however, cannot be depended upon in determining the malignancy; hence, because of these present limitations, it would appear to be advisable to make a complete extirpation of the uterus when syncytial tissue is found in the scrapings. The cases which have recovered after the removal of the vaginal growth without hysterectomy do not, as far as present knowledge goes, justify leaving the uterus unless, by an exploratory curettage, the uterus is found free from all chorionic epithelium.

The relation of hydatiform mole to chorioepithelioma malignum is discussed on page 177.

The diagnosis of the malignant character of a chorioepithelioma cannot be based upon the macroscopic or microscopic appearances of the growth, nor will the presence of metastatic growths confirm the diagnosis. The histological and naked-eye appearances are the same in the benign as in the malignant forms, and metastatic growths have been known to disappear spontaneously. The ultimate clinical course must therefore be depended upon for the diagnosis of malignancy.

Treatment.—The treatment consists in the removal of the entire uterus and its appendages at the earliest possible moment.

The high mortality in cases following labor at term is very striking.

CHAPTER XI

NON-OPERATIVE METHODS OF TREATMENT

Hydrotherapy
Hot Air Treatment
Hot Pack
Counter-irritation
Tampons
Pelvic Massage
Pressure Therapy
Electricity
X-ray Therapy
Swabs
Serum and Organotherapy

Prior to the days of antisepsis and asepsis, operations were performed for the relief of only a limited number of the diseases peculiar to women and these were practically confined to the plastic operations upon the cervix, vagina, and perineum. Even these operations did not meet with general favor because of the dangers involved from hemorrhage and infection, and the small percentage of satisfactory results.

At such a time it was but natural that relief should be sought in more conservative ways. Accordingly the profession seriously discussed the value of electricity, massage, internal medication, etc., for relief from ailments which are now regarded as preëminently surgical. The explanation for these measures lay not only in the shortcomings of surgery, but, in part, in the lack of knowledge of the pathology of intrapelvic lesions. As a logical sequence, diagnosis and treatment had no rational scientific basis.

The advent of antiseptic surgery ultimately made possible the exploration of the pelvic cavity with comparative safety, thereby affording abundant opportunities for the study of these lesions. An operative furore was created, which for a time so possessed the profession that non-operative means of relieving the ailments of women were almost wholly lost sight of. Organs were sacrified, partly in ignorance, partly for greed of gain.

Happily, at no time were these extreme practices universally commended; there were always weighty voices raised to challenge the practices of the rash, the vicious, and the ignorant.

Having applied non-operative methods to all but the exclusion of the operative, and later the operative to the nearly universal annihilation of the non-operative, the profession has come to the position of true conservatism. The limitations of non-operative therapy are now appreciated, and it is accorded its rightful place in the treatment of diseases of women. Similarly surgery now has its limitations; the one is not employed to the exclusion of the other but, hand in hand, they work for good.

General and local treatments are made to accomplish what surgery

has failed to do in selected cases. More often they are used as a forerunner and accompaniment of surgery, and as a means of obtaining a better result subsequent to operation.

The author believes in the inestimable value of so-called local treatments, not only as an aid to surgery, but also in many instances as the only method required to obtain the desired result. Everything depends upon the intelligent application of the treatments. As often practised they are of no value and are more meddlesome than useful.

In order that their full value may be understood and their limitations be clearly defined, the author deems it necessary to present a detailed description of the technic, and a comprehensive discussion of the indications and contraindications for all non-operative, therapeutic measures applied to diseases of women. They are worthy of more generous recognition than has heretofore been accorded to them in text-books and monographs.

The physician who is most successful in the treatment of diseases peculiar to women will give due consideration to all conditions—physical, social, and moral—which influence the life of women, and he must not lose sight of the fact that gynecology is an integral part of the general medical science. Hence it follows that the genital organs of women are not a law unto themselves, but are subject to the laws which govern the body in general.

HYDROTHERAPY

Baths
Vaginal Douche
Intra-uterine Douche
Saline Injections
    Enteroclysis
    Hypodermoclysis
    Intravenous
Ice-bag
Hot Compresses
Hot-water Bag
Water Drinking

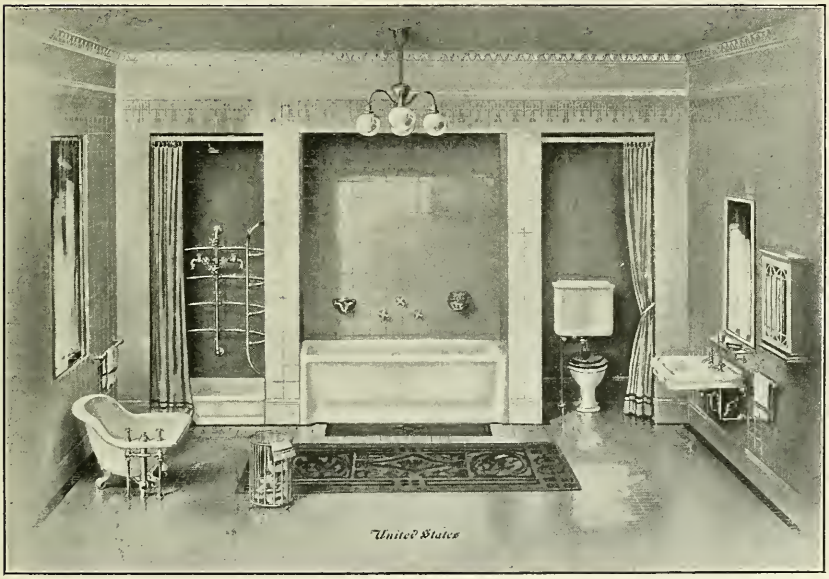
Baruch says: "A somewhat extensive experience has convinced me that, although water is a simple remedy and so easily applied that anyone seems justified in using it, I must insist, with full consciousness of the import of my words, that no remedy in the entire materia medica demands as clear judgment and as much knowledge of the patient's condition as does the application of water."

The value of water as a remedial agent is not fully appreciated, because the physiological action of water is not generally understood by the profession. Hydrotherapy, accordingly, is not applied with that discriminating sense which brings desired results. Water is one of the most valuable therapeutic agents in the treatment of diseases of women, but the laws of hydrotherapy must be understood if they are to be applied successfully. The physiological action of water applied to the surface of the body or to the vagina and bowel produces a mechanical

effect upon the tissues with which it comes in contact, and upon the nerves and vessels supplying these structures.

The direct impact of the water cleanses the surface or cavity and stimulates the peripheral vasomotor nerves, thereby producing a primary effect of stimulation in proportion to the force of impact and to the degree of heat or cold. If the application is long continued the effect of stimulation gives place to that of relaxation. If the area involved is of considerable extent the general vascular system will be influenced in the same manner as are the vessels in the tissues directly affected. By stimulating the general circulation, the nutrition and secretions of the body are influenced; thus, a general as well as a local reaction is obtained which contributes to the general well-being.

FIG. 83



A modern bath.

Baths.—By the application of hot or cold water to the surface of the body, both the vasomotor nerves and the muscular fibers are stimulated. In this respect cold produces the same effect as heat, differing only in degree. The degree of heat or cold and the duration of the application determine the effect upon the tissues as to whether the reaction will be short or long, great or little.

This period of reaction is in two stages, (1) of stimulation, (2) of relaxation. In the first stage the bloodvessels are constricted, hence the supply of blood is lessened in the tissues directly affected; in the

second stage the walls of the bloodvessels are relaxed, thereby increasing the blood-supply to the parts immediately affected. It is estimated that the cutaneous bloodvessels are capable of accommodating 60 per cent. of the blood of the body, hence baths have much to do in controlling the distribution of the blood.

Temperature.—The temperature of the water is a most essential factor in the successful application of the bath. By regulating the temperature it is possible to obtain a stimulating or relaxing effect and to accomplish the effect quickly or slowly according to the degree of temperature.

The effect of cold upon the respiration is that of stimulation. The respiratory act is deepened, thus oxidation is increased and an excess of carbon dioxide is thrown off. By stimulating the heart and contracting the peripheral bloodvessels the blood tension is heightened. Cold baths at daily intervals, when properly administered, will tend to increase the general nutrition; to promote secretions and excretions and in time to improve the functional activity and structural development of the body.

The primary effect of moderate degrees of heat is mildly stimulating and the secondary effect is that of relaxation. The primary effect of high degrees of heat is at first stimulating then relaxing.

Duration.—A bath or douche of short duration, whether hot or cold, is stimulating, and in proportion to the degree of heat or cold. With the continuance of the bath the stage of relaxation comes and continues in proportion to the degree of heat or cold, to the duration of the bath and to the physical resistance of the individual.

The Position of the Patient.—The position of the patient while taking the bath or douche has much to do with the results. (See page 197.)

Rest and Friction after the Bath.—When a stimulating effect is desired the bath should be followed by friction of the body with a coarse towel, and should be both preceded and followed by systematic exercise to promote the circulation and thus favor a prompt reaction.

Sedative baths should be followed by rest and the body should be dried with a soft towel without friction. The idiosyncrasies and state of health of the individual must be considered in the enforcement of these rules.

A short cold bath and to a lesser degree a short hot bath are stimulating. Blood is first forced to the deeper parts of the body; the respirations are deepened. This in turn stimulates the heart and thereby increases the blood supply to the body. In this manner the tissues are better nourished and all functions of organs are more active. All this leads to a heightened power of resistance to morbid processes. If the tissues react promptly to the stimulating effects of the bath there is a general invigoration of the whole body, and this is increased by friction of the body and exercise.

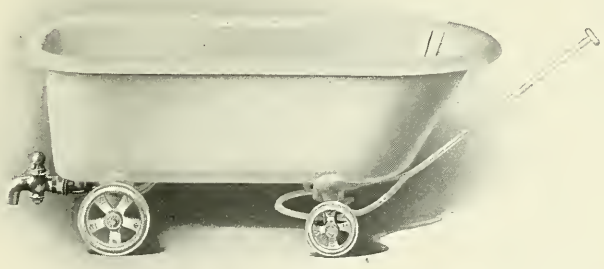
Time for Taking a Bath.—As a rule a stimulating bath should be taken in the morning upon rising and a sedative bath in the evening before retiring.

Varieties of Baths.—Sponge Bath.—The sponge bath has a stimulating effect if taken hot, cold, or alternating. The hot sponge bath is seldom employed. In the cold sponge bath there is a stimulating action. After exercise it is invigorating and refreshing. The temperature of the bath-ranges from 50° to 70° F. It is best taken standing in a bath-tub. When the individual is not accustomed to cold baths it would be well to begin with a temperature of 70° to 80° F. and gradually lower the temperature to 50° F.

Occasionally the alternating sponge bath is recommended for its stimulating qualities. Two basins are placed side by side in a bath-tub, one filled with water at 110° the other at 50° F. Standing in the bath-tub the individual quickly alternates from one basin to the other, using a sponge. Vigorous friction with a coarse towel should follow the sponge bath, after which some light exercise should be indulged in, such as walking briskly.

Sponging in Bed.—When for any reason the patient cannot stand throughout the bath she may be sponged in bed. She lies upon a rubber sheet and is covered by a woollen blanket. The body should be kept covered during the bath, so far as possible. Equal parts of alcohol and water are applied at a temperature of 70° to 75°.

Fig. 84



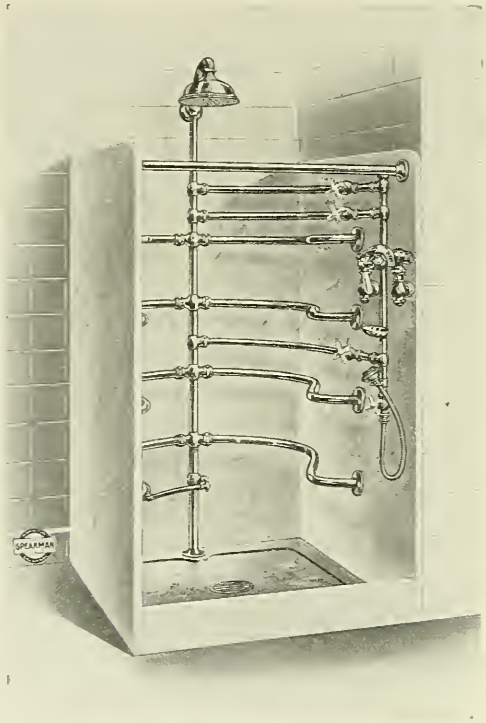
Portable tub.

Shower Bath.—The action of the cold shower is stimulating. For convenience, the adjustable shower bath with a rubber sheet attachment is preferred. This can be arranged to overhang the bath-tub with little expense. A less expensive apparatus consists of an adjustable spray attached to the spigot of the bath-tub by a flexible tube several feet in length. In the absence of suitable plumbing, such as pray may be attached to a fountain syringe. With such an apparatus the patient may stand in a tub.

The force of the spray as well as the temperature of the water determine the stimulating effect of the bath. The colder the water

and the greater the force the more rapid and more pronounced the reaction. As with the sponge bath so with the shower, the water may be cold or graduated from lukewarm to cold; again, it may be alternating from hot to cold. The spray is directed first to the shoulders, then to the chest, back, abdomen, and extremities, and should not, as a rule, exceed thirty seconds in time, and should never be prolonged beyond two or three minutes.

Fig. 85



Shower bath.

As with all cold baths, the shower bath is best taken in the morning after light exercise, and should be followed by rubbing with a coarse towel.

The graduated shower bath should begin at about 80° F., and the temperature lowered 2° each day until 50° F. are reached.

The alternating spray begins at 100° to 114° F. and abruptly changes to 50° to 70° F.

The Half Bath.—The tub is filled with water sufficient to cover half the body, with the patient in the recumbent position. The bath may be hot or cold according to the indication. The same precautions should be taken as in the other varieties of baths. If a stimulating effect is desired the temperature of the water may be fixed at 80° F.; in

this the patient lies for a few minutes, then rises for a short cold shower and vigorous friction of the body.

If a sedative effect is desired the temperature of the water should be about 80° F., and the duration of the bath twenty to thirty minutes, after which the body is dried with a soft towel, without friction. The body is then wrapped in a woollen blanket or bath robe. It would be well for the patient to lie on a couch or bed for a half hour or more after such a bath.

The Full Tub Bath.—The full tub bath may be stimulating or sedative according to the temperature of the water and the length of the application. The prolonged hot tub bath is sedative, and should not be preceded by exercise. It is best taken at bedtime and should not be followed by vigorous rubbing or exercise. The temperature of the hot bath ranges from 100° to 114° F., and the duration is ten to thirty minutes, according to the reaction of the individual and the effect required. Long hot baths frequently repeated are debilitating.

The hotter the bath the quicker and the more pronounced the reaction.

The warm tub bath at 75° to 90° F. is sedative in its effect but the reaction comes slowly. It is subject to the same regulations as the hot bath.

The Cold Tub Bath.—With the water at 50° F. the bath is decidedly stimulating. In order that the reaction will not be delayed it should be preceded by sufficient exercise to stimulate the circulation. As with all cold baths it is best taken in the morning upon rising, and should be followed by vigorous rubbing with a coarse towel. The duration of the plunge should not exceed thirty seconds unless the individual is very vigorous. Depression will follow a prolonged cold bath. Chill, languor, or drowsiness coming on after the bath are contra-indications. Old age is a contra-indication, as is arteriosclerosis and other evidences of senility.

The Sitz Bath.—Sitz baths are applied to the pelvis and its contents; they operate upon this region of the body as does a full bath upon the general system. They are given cold, hot, or graduated.

Cold Sitz Baths.—Cold sitz baths are given at a temperature of 50° to 75° F. They are seldom employed and are of little value. Their duration should not exceed one to five minutes, after which the body should be quickly dried, and a rest of a half hour or more should be enjoined.

The cold sitz bath is indicated in amenorrhea not dependent upon pregnancy, in lactation atrophy of the uterus, in muscular insufficiency of the uterus causing hemorrhage and leucorrhea, and in subinvolution, passive congestion, and chronic inflammation of the uterus.

The contra-indications are pregnancy, menstruation, acute pelvic inflammation, and spastic conditions of the bladder.

Prolonged Hot Sitz Bath.—The prolonged hot sitz bath is of value in relieving congestion and in favoring the absorption of pelvic exudates.

Hot sitz baths are usually taken at bedtime, and have a sedative

effect on the tissues directly affected. The temperature of the water ranges from 110° to 114° F., and is continued from twenty to thirty minutes.

The graduated sitz baths begin at a temperature of about 100° F., and cold water is added until the patient begins to feel chilly, when she is removed from the bath, dried, and placed in bed between warm blankets. The effect is slightly stimulating.

Sea Bath.—Sea bathing is very beneficial on account of its stimulating effects, if taken judiciously. The benefit derived does not depend solely upon the effect of the water. The change of scene, diet, and air are most helpful; these factors, together with the cool plunges and the invigorating effects of the surf, act as a tonic to the general system. If prolonged the effect may be exhaustion, hence the temptation to remain long in the water must be resisted. As soon as the sense of chilliness is felt the bath must be discontinued and the body rubbed with a coarse towel. These baths should only be taken in the sunshine, when the reaction will be more prompt. They are of special value because of the attending muscular exertion. It is well to take a brisk walk on the beach before and after the bath.

Salt Baths.—The addition of two five-pound packages of sea salt to the cold tub bath adds to the stimulating effects of the bath; furthermore, sea salt added to the hot tub bath augments the sedative effect.

The Turkish Bath.—To equip the home with a turkish bath requires a specially constructed apparatus. A cabinet may be made of a steel frame covered with a double layer of rubber sheeting. In the top is an opening through which the head protrudes. Enclosed within the cabinet is a stool on which the patient sits, and under this stool is placed an alcohol lamp or gas stove. The cabinet should be heated for ten minutes before the patient enters it.

The hot-air bath should continue ten to twenty minutes, and immediately upon leaving the cabinet the patient should be given a hot shower bath at a temperature of 100° to 110° F., this to be followed by a cold shower of 50° to 75° F., and, finally, there should be vigorous rubbing of the body with a coarse towel, after which the patient is wrapped in a blanket and placed on a couch for a half-hour or more. Water should be drunk freely both before and during the bath.

Free perspiration is usually excited within ten minutes of the beginning of the bath. If throbbing of the head occurs or the pulse reaches 120 to the minute the bath must be discontinued. A cold cloth to the head will add to the comfort of the patient.

The Russian Bath.—The apparatus and general technic of the bath is the same as in the Turkish bath, with the exception that a kettle filled with water is placed over the stove to generate steam.

The Sheet Bath.—A muslin sheet is wrung out in iced water and wrapped about the body. With a wet towel the attendant slaps the body vigorously. Sharp, quick strokes are kept up for from two to five minutes. The sheet is then removed and the skin vigorously rubbed

with a coarse towel. The patient is then placed in bed, wrapped in a blanket. Such a bath is stimulating in its effects, and is best given in the morning.

Bathing during the Menstrual Period.—There is no reason why a woman who is in the habit of taking daily baths should be deprived of them while menstruating. A menstruating woman in good health will suffer no ill effects from a hot or cold bath provided certain precautions are taken, and it may be said of all women that their personal comfort and general health will be the better if such daily baths are taken during the menstrual period. The rules of hygiene demand that a daily tepid bath (80° to 90° F.) be taken throughout the menstrual period. Women should be cautioned against the dangers of chilling the body during and following the bath. Sea-bathing, for this reason, is dangerous.

The Nauheim Bath.—The stimulating effect of a bath may be augmented and made more agreeable by the addition of certain chemical substances. In this manner a pronounced reaction is effected which alters the distribution of the blood so that the congestion of internal organs is relieved. The number of red blood cells is increased in the circulating blood, the tone of the tissues, including the heart, is increased, and by stimulating the trophic central nervous system the general tissue metabolism is increased. By adding to the bath water a chemical stimulus the effect is most agreeable and prompt. The addition of salt augments the stimulating qualities, and because of this the individual will take the bath at a lower temperature.

The Nauheim bath consists of a bath containing salt, calcium chloride, and carbonic acid gas, in varying proportions. The temperature of the bath varies from 80° to 95° F., and should be continued five to twenty minutes. At the beginning of the treatments there should be added to the tub of water 3 to 5 pounds of sea salt, 2 to 4 ounces of calcium chloride, and one-half box of triton salts. After each third or fourth bath a little more of each salt should be added if the patient responds well to the baths. The temperature of the bath which begins at 75° F. is gradually lowered to 85° F., provided the change is agreeable to the patient. After the bath the body is gently dried with warm towels, a hot drink of milk or tea is taken, and the patient lies down for a rest of an hour or two.

It will be seen that these baths are eminently stimulating, and as such are applied to individuals suffering from chlorosis with accompanying amenorrhea, faulty development of the genitalia, subinvolution of the uterus, and all lesions of the pelvic organs which are associated with pelvic congestion, such as chronic metritis, pelvic cellulitis, and salpingitis. They are also said to add tone to relaxed pelvic and abdominal organs as seen in general visceroptosis. Neurasthenic conditions are favorably influenced by these baths. The nervous manifestations of the change of life are greatly relieved by the judicious application of these baths. It is imperative that they should be given under the direction of the physician, because the reaction of the individual

depends upon the strength of the baths, upon their temperature and duration.

The Therapeutic Application of Baths.—*Sedative Bath* (Hot).—The relaxing effect of a prolonged warm bath has been noted. It follows that such a bath would be applicable to nervous and excitable individuals, to insomnia, to spastic dysmenorrhea, to the various nervous manifestations of the climacteric, and to pelvic congestion from whatever cause. They are best given in the evening just before retiring, and should be followed by a drink of hot milk or hot lemonade.

Stimulating Bath (Cold).—Inasmuch as the cold bath is stimulating to the vasomotor nerves, to the superficial muscles, and indirectly quickens the general circulation, driving the blood to internal organs, thereby stimulating the functions of these organs, it follows that the

FIG. 86

Vaginal douche. Patient lying upon her back. The vagina is distended.

cold stimulating bath is of special value in neurasthenic states, in general malnutrition, chlorosis and other forms of anemia, in amenorrheics, especially when associated with chlorosis and in visceroptosis with relaxation of the supports to the pelvic organs. The bath is best given in the morning, and should be followed by brisk rubbing with a coarse towel and moderate exercise if the condition of the patient will permit.

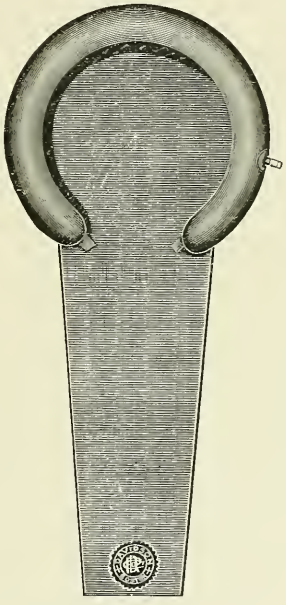
The Vaginal Douche.—One of the most valuable agencies in the treatment of diseases of women is the vaginal douche. Like the bath its modus operandi is not generally understood, and when wrongly applied is capable of doing harm, but when rightly applied the vaginal douche acts as a stimulant to the vasomotor nerves and to the uterine musculature. As a cleansing agency it is indispensable, and as a means

of conveying certain remedies to the vagina and vaginal portion of the cervix it is of service.

Physiological Action.—The physiological action depends upon the manner of its application. The posture of the patient and the duration and temperature of the douche are all essential factors in obtaining the desired results.

Posture.—For all purposes the recumbent posture is essential in order that the fluid may come in direct contact with the vault of the vagina and cervix and indirectly with the pelvic structures.

Fig. 87



Kelly pad.

The position should be such as to permit the patient to lie in comfort, without exertion, and without fear of soiling the bed or couch. The complaint is frequently made that hot douches are exhausting; the explanation usually lies in a faulty posture. Lying upon an uncomfortable douche-pan that is repeatedly overfilling, requiring its removal from time to time in the process of the douche, is a source of annoyance, and is exhausting. A small spout placed at the upper end of a metallic douche-pan, to which a rubber tube is attached, will serve to carry the douche water from the pan to a bucket at the side of the bed. If the bed is firm, a Kelly pad will serve as a substitute for the douche-pan.

For cleansing purposes an ordinary rubber douche bag, holding four quarts, will serve the purpose, but when the douche must be long

continued it is advisable to provide a receptacle holding two to four gallons of water. For this purpose the author usually has a galvanized zinc or tin bucket made. It has a capacity of four gallons; a small spout is attached near the bottom, to which a rubber tubing is attached. With such a contrivance and the bed-pan already described a prolonged douche can be given without discomfort to the patient and without exhausting her strength.

FIG. 88

Vaginal douche.

The reservoir should not be placed higher than four feet above the hips; if pain is caused by the impact of the douche water it should be lowered.

A light woollen blanket is thrown over the patient while she is taking

the douche and the temperature of the room should be maintained at 75° to 80° F.

Temperature.—The temperature of the douche water is an important factor and largely governs the effect of the douche. A temperature of 110° to 120° F. is well borne. Cold douches are injurious and cannot be too strongly condemned. The pernicious habit of taking cold douches to prevent conception and to delay the menstrual period is productive of much harm in creating a pelvic congestion. Cold douches have been recommended for chronic metritis (Skutsch), for prolapsus uteri, hyperemia uteri, and climacteric hemorrhages (Kisch), but the author cannot indorse these suggestions.

Duration.—The duration of the douche is second only in importance to the temperature. A hot douche of short duration (three to five minutes) stimulates the vasomotor nerves and the uterine musculature. In so doing the vaginal cavity is not only cleansed but the uterus is made to contract and the bloodvessels of the pelvis are constricted, thereby raising the blood pressure. With the hot douche prolonged for a period of ten to twenty minutes the uterine musculature relaxes, the caliber of the vessels widens, and congestion is relieved.

From this action of the hot douche it is seen that hemorrhages from the uterus are best controlled by a short, hot douche; the effect is due to uterine contraction. Leucorrheal discharges arising from the uterus are influenced in like manner. The great purpose of the short, hot douche is the cleansing of the vagina. The prolonged hot douche is a most efficient means of relieving pelvic congestion, wherever located within the pelvis, and in favoring the absorption of inflammatory exudates.

Time of Application.—The time of application will depend upon the indication as well as upon convenience. When given for cleansing purposes the amount and character of the secretions will determine the quantity and frequency of the douche. When the discharge is profuse, irritating, and odorous, the douche should be repeated two or more times daily, but otherwise a single morning douche will suffice.

The judicious employment of cleansing vaginal douches will largely prevent the irritating effects of uterine discharges and the development of vulvovaginitis in the presence of a discharge from an infected uterus. It must be borne in mind that hot douches too freely given macerate the vaginal and vulvar epithelium and render the underlying tissues susceptible to infection. In the presence of a pelvic congestion or an inflammatory exudate in the pelvis the hot douche should not only be prolonged ten to twenty minutes, but in order that the effect may be continuous these douches should be repeated every four to eight hours.

The duration of the treatment depends solely upon the results obtained. As long as there is an active congestion the douches must be given at frequent intervals, but as the congestion subsides the intervals between douches are lengthened, but the duration of the douche

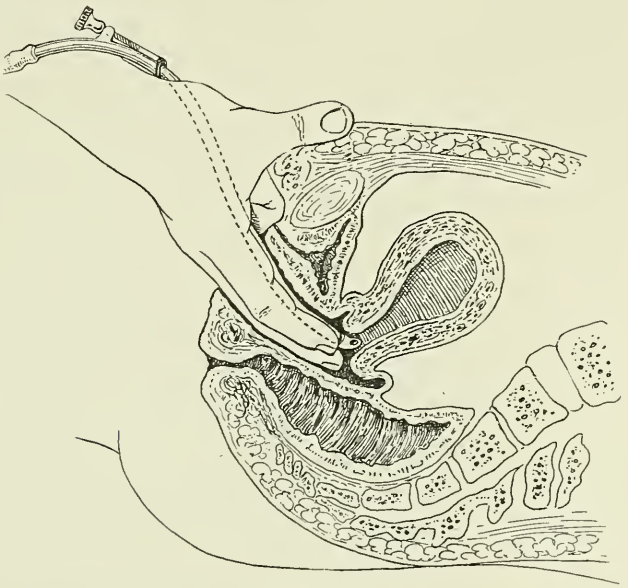
is not shortened. It is not only desired that relief be given for the time being, but that the results may be permanent; hence the douches must be persisted in so long as there is any evidence of the preëxisting lesion.

Medicated Vaginal Douche.—Antiseptic solutions are frequently applied, but their value is, as a rule, uncertain. The vast majority of infections are located above the external os and hence cannot be reached by the douche. In such cases the vaginal douche is of no value as an antiseptic agent and serves solely the purpose of cleansing the vagina and in relieving the congestion of the structures lying above the vagina, hence sterile water is just as effective as an antiseptic solution; the effect is thermic, not chemic.

It is only when the vaginal and vulvar tissues are infected that the antiseptic douche possesses special virtues; such instances are relatively rare. It is therefore seen that antiseptic vaginal douches have little advantage over aseptic douches. When the discharge has a foul odor, as is the case with advanced cancer, permanganate of potassium or formalin will serve to correct the odor.

All sorts of antiseptics have been used. The author's preference is for formalin, 1 to 2000 to 1 to 4000. It is an effective deodorizer and antiseptic; the author employs it as a vaginal douche to the exclusion of all other antiseptics.

FIG. 89

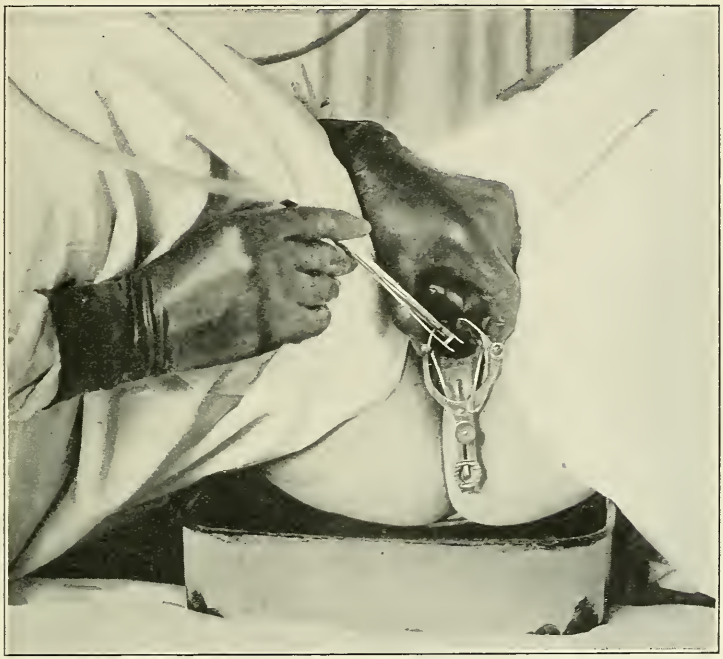


Intra-uterine douche. The douche point is directed to the cervix by passing along the palmar surface of the finger.

Intra-uterine Douche.—The intra-uterine douche has a limited field of usefulness, and is capable of much harm as compared with the

vaginal douche. Indeed, in the author's judgment there is no great indication for intra-uterine douches in gynecological practice; it is largely an obstetrical procedure, and in obstetrical practice it has its limitations.

Fig. 90



Intra-uterine douche.

Limitations.—It is of little value in gynecological practice because foreign particles can be dislodged from the cavity of the uterus by means of the swab, fingers, curet, and forceps, and medicinal agencies can be applied to the endometrium more effectively and with greater safety by means of the swab. In intra-uterine douches there is always the danger of forcing fluids from the uterus into the tubes and on to the peritoneum. This danger is particularly imminent in the puerperal uterus.

Physiological Action.—The action of the hot intra-uterine douche is stimulating if given over a short period; it stimulates the vasomotor nerves, the vessel walls, and the uterine musculature. It also serves to cleanse the uterine cavity. When long continued the effect is to relax the uterine musculature and the walls of the bloodvessels. The apparatus differs from that of the vaginal douche only in the douche point, which is longer and is provided with a return flow.

Technic.—The technic of an intra-uterine douche is as follows: The patient is placed upon a table or firm couch or bed. If she is weak, every means should be employed to conserve her strength;

she should lie lengthwise of the bed, and a Kelly pad or bed-pan with an exit spout should be placed under the hips. If it is possible to move her without exhausting her strength or causing pain, it is better to place her crosswise of the bed with the hips well to the margin of the bed. The feet of the patient may rest upon two chairs placed at the side of the bed.

The vulva should be washed with green soap and sterile water followed by lysol or creolin solution or painted with 3 per cent. tincture of iodine solution. A sterile bivalve speculum is inserted into the vagina and the cervix exposed to view. A sterile reservoir, holding two to four quarts of sterile normal salt solution, or a mild antiseptic such as formalin 1 to 4000 or bichloride of mercury 1 to 4000 is placed about two feet about the level of the hips. This reservoir is provided with a sterile rubber tubing and glass or metallic douche point.

The temperature of the douche solution ranges from 110° to 120° F., which is accurately determined by a bath thermometer. Under direct inspection the douche point is guided through the cervix into the cavity of the uterus. Before introducing the douche point into the uterus a slow stream of solution should be allowed to flow in order that all air may be expelled. The solution is then allowed to flow into the uterine cavity at a low pressure, taking care that there is a free return flow.

FIG. 91

Leonard's uterine douche.

While giving the douche, chilling of the body should be avoided by providing a warm temperature for the room and a covering of blankets for the patient.

After completing the douche the external genitals are dried and the patient is placed comfortably in bed. If iodine is used to disinfect the vulva it is well to remove the iodine in part by bathing the painted surface with alcohol; this will avoid subsequent irritation.

The virtue of the intra-uterine douche lies largely in its mechanical and thermic effects; therefore sterile water or normal salt solution will be less dangerous and perhaps equally as effective as antiseptics.

When, however, antiseptic solutions are given they should be greatly attenuated because of the absorbing power of the uterus and the danger of forcing the solution into the peritoneal cavity through the Fallopian tubes.

Saline Injections.—The injection of a sterile physiological solution of salt into the circulation of the blood is recognized as one of the most

valuable therapeutic agencies at the command of the physician. *As a non-operative, life-saving agency, normal salt solution has no equal.*

General Indications.—Normal salt solution finds its greatest indication in the treatment of shock from loss of blood. It is also of great value in the treatment of renal insufficiency, general sepsis, and in uncontrollable vomiting following operations, and as a routine procedure after prolonged operations for the purpose of relieving depression and quenching the thirst.

For fear of increasing the blood pressure, normal salt injections should not be given in postoperative hemorrhages until the bleeding vessels are secured.

The choice of the method of its administration is governed by the urgency of the indication. When prompt action is demanded intravenous injections should be employed. When there is less urgency, hypodermoclysis is the method of choice; and when the depression is but slight, the diminution in the secretions of the kidney not alarming, or the loss of blood not great, enterocylsis is preferred unless contraindicated by conditions of the bowel, such as obstruction, recent operations upon the lower bowel, and injuries to the bowel wall acquired in operation.

Enteroclysis.—*Technic.*—The reservoir for containing the solution may be a rubber bag holding two to four quarts or a graduated glass receptacle. To the reservoir is attached a rubber tube several feet in length, on the end of which is a rectal douche point made of glass or hard rubber. This apparatus is sterilized by boiling in water or by placing in an instrument sterilizer. A sterile thermometer should be provided by which the temperature of the solution may be accurately measured.

Quantity of the Solution.—One to two quarts of sterile normal salt solution are placed in the reservoir at a temperature of 110° F. If additional stimulation is indicated a half-ounce of whisky or brandy may be added to the salt solution. Half and half of salt solution and black coffee is an effective enema.

Rapidity of Administration.—The urgency of the indication and the absorbing power of the bowel will govern the rapidity of the administration.

As a rule one to two pints of the solution are injected into the bowel four to six times in twenty-four hours throughout the period of depression, and the time allotted to each injection will range from five to fifteen minutes.

When the reaction has set in, as indicated by the increase in the volume of the pulse and the added quantity of urine secreted, the interval between the injections should be gradually increased.

The continuous injections of normal salt solution in the bowel are of special value when there is profound shock from loss of blood or grave and progressive general sepsis. The technic consists in elevating the foot of the bed and hips to an angle to 20 to 30 degrees; the rectal tube is inserted high in the colon; the reservoir is placed at a

low level to provide but little pressure in order that the solution may enter the bowel slowly.

An hour should be consumed in the injection of a single pint of the solution. These injections should not be permitted to embarrass the heart action by increasing the vascular tension beyond the ability of the heart to propel the blood current. Such an event is particularly imminent when there is faulty elimination from the kidneys, bowel and skin.

FIG. 92

Tube for drop method.

Several degrees of temperature are lost in the passage of the solution through the tube, hence the necessity of keeping the solution in the reservoir at about 114° F.

When not contra-indicated these continuous irrigations may be prolonged over many hours and even for a day or two.

Sooner or later there is likely to develop an irritable condition of the bowel, in which event the injections must be discontinued and hypodermoclysis substituted if the condition of the patient demands it.

Hypodermoclysis. — *Apparatus.*—The apparatus is identical to that used in enteroclysis with the substitution of an aspirating needle for a rectal tube.

Preparation of the Field of Operation. — Surgical principles are to be applied to the preparation of the field of operation. The part to be injected should be thoroughly cleansed with green soap and sterile water, dried with sterile gauze and finally scrubbed with alcohol. A more convenient method of sterilization is the painting of the field with tincture of iodine. After completing the injection the puncture is sealed with collodion and sterile cotton.

Temperature.—The temperature of the injected solution should be 112° F.; this will favor rapid absorption and a prompt reaction.

Quantity.—The quantity of the solution injected should not exceed one pint and may be repeated once in four to six hours until the reaction is well established. From fifteen to thirty minutes should be consumed in the injection of a single pint.

Massage.—Massage of the injected area will favor the absorption of the solution and may be carried on throughout the process of injection.

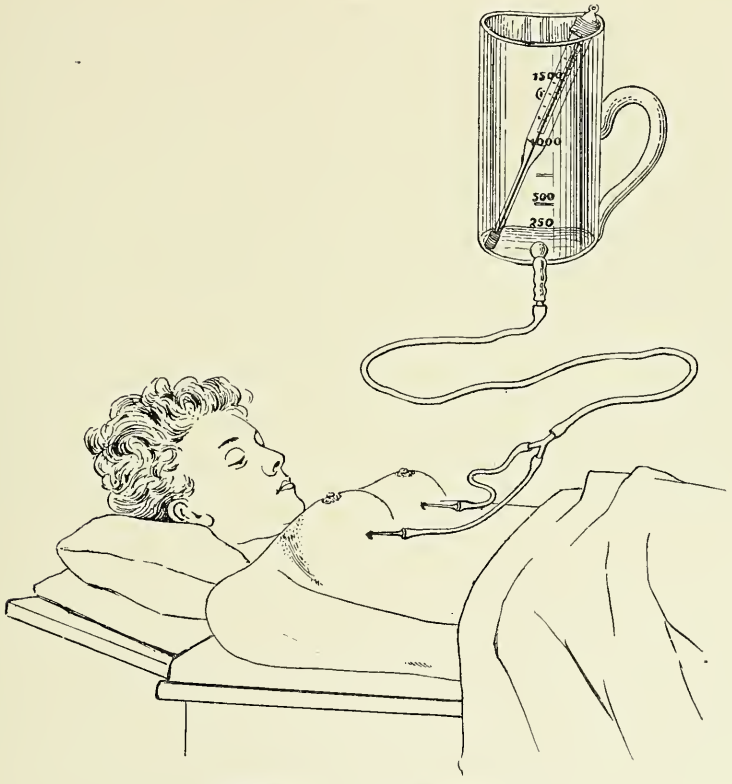
Technic.—The point of injection should be at the seat of an abundance of loose connective tissue, preferably in the breast, the midaxillary line three inches below the axilla, or in the lumbar region.

The author has never employed local anesthesia before the injection, because the introduction of the aspirating needle causes little more pain than the hypodermic needle. When a local anesthetic is desired a 2 per cent. solution of the hydrochlorate of cocaine or freezing with ethyl chloride may be employed.

The reservoir, tubing, and aspirating needle must be rendered sterile

by boiling. A known quantity of sterile salt solution is placed in the reservoir, and an assistant is instructed to hold the reservoir about six feet above the level of the field of operation. The operator allows the solution to flow while holding the tubing and needle upright to expel the air and the water which has cooled in the tube. With the solution running, the needle is thrust obliquely through the skin into the subcutaneous connective tissue, taking care that it does not enter the muscles. As the solution infiltrates the connective tissue spaces the skin is raised and stretched. If the solution is not readily

Fig. 93



Administration of normal salt solution.

absorbed, gentle massage of the infiltrated area will hasten the absorption. The temperature of the solution in the reservoir should be kept at 112° F. by the addition from time to time of a hot solution. When the desired amount has been injected the needle is quickly withdrawn, a finger is placed over the puncture in the skin to prevent the escape of the fluid until the wound is dressed with sterile cotton and collodion or sterile gauze and adhesive straps.

Intravenous Injection.—*Indications.*—This method of administration of normal salt solution is practically limited to cases demanding an

immediate reaction. When there has been great loss of blood, the lowered blood pressure may prevent the absorption of the salt solution from the bowel and subcutaneous connective tissue, and demand the introduction of the solution directly into the blood stream.

In septicemia and uremia, when the blood pressure is high, it may be advisable to perform venesection for the removal of a quantity of blood, and to follow the withdrawal of the blood by the introduction of an equal or greater quantity of normal salt solution.

Apparatus.—The apparatus required in intravenous injections consists of a graduated glass reservoir, a thermometer, a rubber tubing several feet in length to which is attached a Shober cannula. In addition to these instruments there will be required a scalpel, a pair of small sharp pointed, straight scissors, tissue forceps, two small curved needles, a needle holder, and No. 2 plain catgut. All instruments, as well as the hands of the operator, must be rendered sterile by the usual methods.

Local Anesthesia.—A 2 per cent. solution of cocaine may be injected at the point of incision. This should render the operation painless.

Technic.—The operation consists in bandaging the arm tightly above the elbow. An incision of three-quarters of an inch in length will suffice for the exposure of the vein. A careful dissection of the vein is then made, freeing it for a distance of about one inch. The vein is ligated with catgut at the lower extremity of the incision. A second ligature is passed about the vein three-quarters of an inch above the lower ligature, but is not tied until the vein is opened and the cannula is in place. The vein wall is grasped with a tissue forceps at a point midway between the ligatures and snipped obliquely upward, making an opening large enough to introduce a cannula into the lumen of the vein. Before introducing the cannula the air and cooled water in the tube should be allowed to flow out. The vein is then tied snugly over the cannula. The compression above the elbow is removed, and the solution is permitted to flow into the vein.

When the required amount of solution has been injected a third ligature is passed above the second to secure the proximal end of the vein; the second ligature is cut and removed and the cannula withdrawn. The incision in the skin is then closed with silk, linen, or horse-hair, and the wound dressed in a sterile bandage.

Quantity.—The quantity of fluid injected varies from one to four pints and may be repeated in two or more hours. As a rule the injection is not repeated but is reinforced by hypodermoclysis or enteroclysis.

Temperature.—The temperature of the solution in the reservoir should be kept at 105° F. This should be accurately measured by a thermometer kept immersed in the solution in the reservoir.

The weaker the pulse the lower should the reservoir be held in giving the injection for fear of introducing the solution too rapidly into the circulation.

Ice-bag.—A rubber ice-bag is partly filled with cracked ice. This is placed in direct contact with the surface of the body. If the intense cold causes discomfort it may be wrapped in muslin. When the ice has melted the bag should be refilled.

Simpson recommends the application of the ice-bag to the abdomen after all abdominal operations. He believes that it will prevent the development of peritonitis to a degree and will have a decided influence in allaying a preëxisting inflammation.

Fig. 94

Application of ice-bags to abdomen.

Hot Compresses.—The continuous application of heat, either by means of a compress or water-bag, will have a sedative effect, and is, therefore, much used in the relief of pain from whatever cause.

Compresses are made of several layers of flannel or sterile gauze wrung out in hot water. To retain the heat the compress is covered with oil silk or a rubber sheet. A hammock may be made of a towel with sticks at either end. In this device the clothes are wrung by a twisting process.

Hot-water Bag.—A rubber bag containing one to four quarts of hot water, when applied to the surface of the body, will produce an effect upon the tissues with which it comes in contact that varies with the degree of temperature and the time of application. In a general way it may be said that the hot-water bottle produces the same effect upon the vasomotor nerves, bloodvessels, and muscular tissues as does the hot vaginal douche; it is at first, temporarily stimulating; second, relaxing or sedative.

Water Drinking.—Water is not sufficiently appreciated as a remedial agent in various modes of application; this is particularly true of water taken into the stomach.

Physiological Action.—The physiological effect of drinking water depends upon the quantity of water ingested and the degree of temperature. The physiological action of water taken into the stomach is varied. When taken in large quantities it flushes the system by diluting the blood, raising the arterial tension, and promoting the excretions from the body, thus carrying away the waste stuffs from the body through the natural channels—the kidneys, bowels, and skin.

The peristaltic activity of the intestines is increased, the skin and kidneys secrete more freely, and the lungs are made more active in throwing off carbonic oxide gas and in taking in oxygen.

Not only is the elimination of the waste stuffs of the blood favored, but also those which are deposited in the tissues are taken up by the lymph- and blood-streams and are excreted.

The temperature of the water when taken into the stomach, and the quality and quantity of the water determine the physiological effect.

Heat and cold, when applied internally by the drinking of water, have the same effect as when they are applied externally in the form of a bath. It necessarily follows that the amount of water ingested will produce effects that are analogous to the bath, so far as concerns the length of application.

Pure water is the first requisite. That it should be free of pathogenic germs is generally admitted, but there are other qualities which are almost equally important. Water may contain certain organic and mineral substances which are injurious to the body. Mineral salts in water are not essential to the physical economy; sufficient salts are obtained from the foodstuffs.

The function of drinking water is in part to absorb from the tissues certain mineral salts, rather than to carry salts to them. It therefore holds that the purer the water ingested, the greater will be its power of absorption. Water free from mineral salts possesses great power of absorption, and conversely a water surcharged with mineral salts not only fails to absorb salts from the tissues but may actually add to these salts. Lime salts in drinking water account to a degree for the calcareous deposits found within the body, which inhibit the functions of the blood-vessels and the organs they supply. A good filter, kept clean, will eliminate microörganisms from the water, but will not remove the soluble mineral salts. For this reason distilled water becomes the safest and best of drinking waters.

The quantity of water which an individual in good health should drink depends upon the body weight, the activity of the individual, and the temperature. The average quantity is one or two quarts a day. No large quantity should be taken with the meals because the secretions of the stomach become diluted, thereby interfering with digestion. Water should be drunk freely between meals, at bedtime,

and upon rising in the morning. Hot water is an aid to digestion when taken before meals. Cold water retards digestion, and should never be taken immediately before, during, or shortly after the ingestion of food.

HOT-AIR TREATMENT

Physiological Action | Technic
Indications and Contraindications |

The author has had but a limited experience in the use of hot air as a remedial agent and the following description is largely based upon the experience of others.

Physiological Action.—An active hyperemia is produced. With a properly applied apparatus this action is not confined to the superficial bloodvessels but extends to the deeper structures. At the beginning of the application, when the temperature is high, there is a temporary contraction of the bloodvessels which is soon followed by dilatation. According to Bier this arterial hyperemia provides nourishment for the tissues, favors the carrying away of waste stuffs, and stimulates the regenerative functions of the tissues to a degree that will fortify the tissues against the invasion of microörganisms.

Indications and Contra-indications.—Pregnancy is an absolute contra-indication to the application of heat to the degree required to obtain a physiological reaction. Fever is also said to be a contra-indication and so are advanced affections of the lungs and incompetent heart action.

The method is recommended for all chronic non-suppurative inflammatory exudates. The application of hot air is also recommended in chronic metritis and lactation atrophy of the uterus, especially when associated with edema.

The very nature of these lesions suggests the limitations of this form of treatment. Little can be expected from any remedy in the management of such lesions.

Hot-air therapy is effective not so much in the correction of morbid anatomical conditions as in bringing about relief from pain associated with chronic inflammatory lesions. This relief may persist for many hours after application, and by repeated applications the pain becomes less in frequency and in severity. The relief from pain is particularly observed when an edematous infiltration is a contributing factor.

Technic.—The application of hot air to the vagina is impracticable. To obtain the required degree of heat would cause pain and a superficial inflammatory reaction.

The method is therefore confined to the skin surface of the abdomen and pelvis. Before proceeding with the treatment all contra-indications must be excluded. The duration of the treatment should not exceed twenty minutes in the beginning and may be gradually increased to an hour. When there is a tendency to faintness a cold cloth may be placed on the head.

After the treatment rest in bed for at least a half-hour should be enjoined. The frequency with which the treatments are repeated will be governed by the individual case.

The degree of heat should at first not exceed 200° F., and later it may gradually be raised to 250° F. The temperature and pulse should be taken at intervals during the application, and a physical examination of the affected area should be made to ascertain the effects of the treatment and to detect any existing complications at the earliest possible time. The treatment may be combined with massage and pressure therapy with good results.

The author has adopted the electric heater of Gellhorn (Fig. 95) with gratifying results.

Fig. 95

Application of dry heat (electric).

HOT PACK

One of the most effective means of quieting a nervous patient is to wrap the body in a sheet wrung out in water at a temperature of 50° to 70° F. Several woollen blankets are then wrapped snugly about the body. In a few minutes the body will begin to perspire freely and often the patient falls into a quiet sleep. This bath has been found of great value in treating maniacal patients.

COUNTER-IRRITATION

Cantharides Plaster
Mustard Plaster

In pelvic inflammation considerable relief from pain may result from the application of counter-irritants over the seat of pain. It is of interest to note that Morris has called attention to the two points of tenderness located over the lumbar ganglia, about one inch below and to either side of the umbilicus. Pressure over these points in the presence of a chronic pelvic inflammation will elicit more or less tenderness. If these areas of tenderness are painted with tincture of iodine, or if a mustard or cantharides plaster is applied, much relief may be afforded. In this manner much of the pain incident to the menstrual period in the course of a pelvic inflammation may be controlled.

Cantharides Plaster.—In applying a cantharides plaster the skin is first cleansed with soap and water, then dried, and smeared with vaseline. Over an area about two inches in diameter on either side is applied a cantharides plaster. This is held in place by two cross-strips of adhesive plaster for six to eight hours until blisters appear. The plaster is then removed, the blisters opened in a cleanly manner, and a zinc ointment applied to the blistered surface. Over this is placed a pad of sterile gauze, held in place by adhesive straps. The surface is dressed daily until all signs of irritation have disappeared. Collodium cantharidations (60 per cent.) may be applied with a camel's-hair brush.

Mustard Plaster.—To prepare a mustard plaster use half and half black mustard and flaxseed meal or flour. If white mustard is used it should be used in the proportion of three of mustard to one of flour or flaxseed meal. These are applied hot for a half hour. If a longer application is desired the proportion of mustard is lessened.

TAMPONS

No one form of topical treatments in diseases of women is so generally employed as tampons. When applied intelligently they are of great value, but in so doing there must be a very clear conception of their indications and of the manner of their application, otherwise they are productive of no good and may do positive harm.

Indications.—The indications for tamponade of the vagina are:

1. Hemorrhage.
2. Pelvic inflammations and congestion.
3. Drainage.
4. Protection against infection.
5. Uterine support.

Hemorrhage.—For the immediate control of hemorrhage from the uterus and vagina, resort may be had to the vaginal tampon. This

measure may suffice for temporary or permanent control of the bleeding, depending upon the seat of the hemorrhage, its cause, and its severity. When the bleeding comes from large vessels in the cervix or vagina, or when the hemorrhage comes from within the uterus and is severe, failure is likely to ensue. However, until more effective means can be employed, tightly packed vaginal tampons should be resorted to.

Form of Tamponade.—*Vaginal Tampons.*—Tampons when tightly packed in the vagina will control bleeding from the vaginal walls, and will be effective in moderate hemorrhages from the cervix and cavity of the uterus.

Whenever a bleeding vessel can be isolated it should be secured by a ligature or transfixed by a suture.

Intra-uterine Tampons.—No other method is so effective in the control of bleeding from the uterus into the uterine cavity. It may be stated, as a general rule, that the uterus should be tamponed after all intra-uterine operations whenever there is a possibility of post-operative hemorrhage. Curettement for conditions such as endometritis is not included in this category.

Technic.—The best material for intra-uterine and vaginal tampons used for the purpose of controlling hemorrhage is sterile, plain, or iodoform gauze. Strips two to four inches in width, several plies in thickness and of sufficient length to pack the uterus and vagina tightly, are preferred.

When the uterine cavity is to be packed a thorough sterilization of the vulva and vagina should precede the packing. The patient is placed crosswise of the bed in the dorsal position and every precaution is taken to protect the gauze from contamination.

A bivalve speculum is introduced through which the cervix is grasped by a tenaculum. The end of the gauze strip is then conveyed to the fundus of the uterus by means of a dressing forceps or sound. This must be done with caution for fear of perforating the uterine wall. The cavity of the uterus is gently but firmly packed from above downward until the entire cavity, including that of the cervix, is filled. More than this the vagina should be firmly packed and a T-binder adjusted over a sterile vulvar pad. When the vagina alone is to be packed for the control of hemorrhage the same aseptic precautions must be exercised, and the packing should be done through a vaginal speculum.

The gauze, as a rule, should be removed by the end of forty-eight hours, and if the hemorrhage still continues fresh gauze may be inserted.

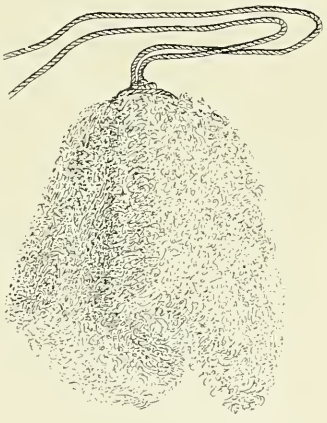
Inflammation and Congestion.—Tampons have a therapeutic value in all stages of pelvic inflammation and congestion. As a vehicle for the introduction of medicaments the vaginal tampon has a large range of application. It provides the only practical and effective means of applying remedies to the vaginal walls and overlying structures.

But few remedies have been accepted as being of very special therapeutic value; such are ichthyol, formalin, iodine, mercurial ointments, glycerin and certain combinations of glycerin, notably boroglycerin and borolyptol. Glycerin and ichthyol are the most generally used

of these remedies. Glycerin withdraws serum from the tissues, and in this manner the tissues of the pelvis are depleted; connective-tissue spaces are emptied of serous exudates, serous elements are withdrawn from pus cavities and the engorged lymph and bloodvessels are relieved. To accomplish this large quantities of glycerin must be used. The vagina should be loosely packed with tampons of sterile cotton or gauze in glycerin. The time required for the application of the glycerin may be stated at six to eight hours. They should then be removed lest they become a source of irritation. The amount of serum that is extracted from the tissues in this way is often astonishing.

As a valuable adjunct to glycerin, ichthyol may be added in the proportion of seven part of ichthyol to ninety-three parts of glycerin. It is claimed for ichthyol that it is somewhat antiseptic and analgesic and an absorbent of cellular elements. These properties in conjunction with the glycerin, which only withdraws the watery elements, makes the combination most effective. Ichthyol is generally accepted as a valuable remedy in the treatment of pelvic inflammations, and especially when combined with glycerin in the proportions given. It is indorsed almost uniformly by practical workers in the field of gynecology. Exudates are absorbed by the liberal application of ichthyol and glycerin—this applies to serous, purulent, and cellular exudates alike. Under this treatment the author has seen large pelvic exudates disappear and pus accumulation absorb. In one case of bilateral pyosalpinx the tubes were not only reduced to their normal size,but pregnancy followed in the course of a year and terminated uneventfully.

FIG. 96



Vaginal tampon of lambs' wool.

The uterus and appendages, enlarged from congestion, are reduced in size and rendered less sensitive. Excessive bloody and leucorrheal discharges are lessened by depleting the engorged lymph and bloodvessels. Menstruation is rendered less painful by relieving the congestion. It is therefore evident that local depleting treatment by means of tampons is worthy of the serious consideration of surgeons. In not a few cases these treatments, combined with prolonged hot douches, and the regulation of the bowels, diet, and exercise, will effect a cure that is impossible by other means.

They are valuable adjuncts to surgery both as a preliminary measure and as a postoperative means of restoring the integrity of the tissues. The surgeon is seldom justified in interfering surgically during the acute stage of a pelvic inflammation unless there is an accumulation of pus that can be drained through the vagina. By first depleting

the tissues the acute inflammatory reaction is allayed, exudates are absorbed and the need for surgical intervention may be averted; organs are safeguarded which have been sacrificed without these preliminary measures.

Postoperative exudates in and about the genital organs demand consideration, otherwise the results will be disappointing. Such exudates may be made to disappear by the treatment outlined. To remove a diseased endometrium and leave a congested uterus affords little or no permanent relief; a healthy endometrium cannot be expected to form, and the congested uterus will remain a disturbing element; hence the value of depleting treatment as a postoperative measure.

The author cannot agree with Dudley, who says that the therapeutic value of medicated tampons is overestimated. While it is true that they are too often misapplied, it is even more true that their therapeutic value is not fully appreciated. The former statement applies particularly to the general practitioner, the latter to the general surgeon.

For subacute and chronic vaginitis the vagina may be loosely packed with strips of sterile gauze saturated with a solution of formalin, 1 part; glycerin, 400 parts; water, 2000 parts. For specific ulcers of the cervix and vagina, tampons of sterile cotton or gauze may be smeared with mercurial ointment.

Duration of Application.—No tampon should be left in the vagina longer than twenty-four hours. The accumulated secretions of the uterus become a source of irritation, hence the tampons should be removed within twenty-four hours and a vaginal douche given.

Frequency of Application.—No set rule can be established for the frequency of application of uterine and vaginal tampons. Each case must be a law unto itself.

When tampons are used for depleting purposes they should be inserted at least every other day. During the acute stage of a pelvic inflammation they should be applied daily. The patient should remain in bed while the tampons are in place, otherwise much of the solution will be lost. For this reason such treatments given in the office are of little value.

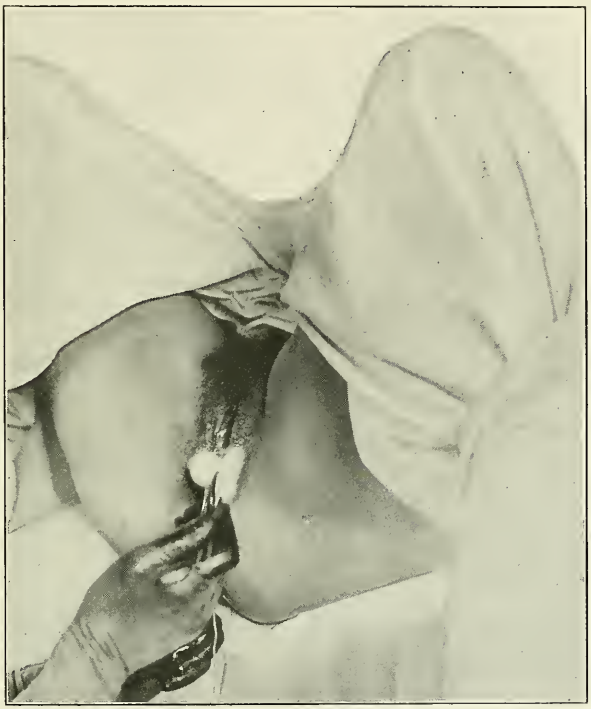
Twenty-four to forty-eight hours is the limit of time for the application of intra-uterine tampons, and it is seldom advisable to repeat the application. There is always the danger of conveying infection to the uterus by tamponing the uterine cavity, and for this reason their application should be as limited as possible.

For the control of hemorrhage, vaginal and intra-uterine tampons are allowed to remain no longer than is demanded for fear that the accumulated blood may undergo decomposition and infection. When removed a vaginal douche should be given.

Drainage.—Some operators drain the uterus with a strip of sterile gauze after curettage. To the author this procedure has never seemed necessary or advisable, because the uterus, in itself, constitutes an ideal drain.

Protection against Infection.—After all intra-uterine operations it is advisable to pack the vagina with sterile or iodoform gauze as a precaution against possible infection of the wound within the uterus. Such dressings should not be left longer than forty-eight hours.

Fig. 97



Insertion of a tampon of lambs' wool.

Support to the Uterus.—Vaginal tampons of sterile lambs' wool are of service in uterine displacements when for any reason a pessary cannot be worn, and operative interference is not permissible. For example, the vagina may not tolerate a pessary, or a uterus and its appendages may be so tender that they do not permit the wearing of a pessary because of pain and the likelihood of exciting an acute inflammatory reaction. Tampons for this purpose are only temporary expedients, and should soon be replaced by the pessary or by operative intervention.

PELVIC MASSAGE

Physiological Action
Indications
Contra-indications
Technic

This therapeutic measure has found little favor in America, although in Sweden, from whence it emanated, and in Germany and France,

it is much practised. The successful application of massage to pelvic disorders implies an accurate diagnosis. The indications are limited to but a few lesions in the pelvis, and the pathological conditions which preclude its application must be recognized if dangers are to be averted.

Physiological Action.—The circulation in the blood and lymph vessels is accelerated. This increases the nutrition of the tissues on the one hand and favors the absorption of exudates on the other. Furthermore, the involuntary muscle fibers of the viscera are made to contract, which in turn favors the circulation in these organs.

Indications.—Chronic Non-suppurating Pelvic Inflammations.—When they involve the uterus, its appendages, the pelvic cellular tissue and peritoneum, well-directed massage is a valuable adjunct to the more generally employed methods of treatment. When the uterus and its appendages are displaced and immobilized to a greater or less degree by adhesions the offending bands may be stretched or severed, thus providing for the replacement of the viscera. Inflammatory exudates in and about the organs of the pelvis are made to disappear by stimulating the lymphatic circulation through a systematic and oft-repeated system of massage.

Contracted Uterine Ligaments.—Contracted uterine ligaments, resulting from an inflammatory infiltration, may be stretched and the inflammatory exudate absorbed by intelligent and persistent massage. By so doing the uterus and its appendages may be placed in their normal position and retained either by the wearing of a suitable pessary or by some operative procedure.

Atony of the Uterine Supports.—Atony of the uterine supports may be corrected when not of long standing, but when the muscular fibers and connective tissue which are incorporated in the uterine supports have lost their power of retraction and contraction the results of massage are not encouraging, and will usually be disappointing.

Incarceration of the Pregnant and Non-pregnant Uterus and of Tumor Formations.—These may be corrected by means of massage. An anesthetic is usually required.

Contra-indications.—Certain conditions may exist in the pelvis which render pelvic massage both useless and dangerous. It is, therefore, imperative that such conditions be excluded before resorting to massage.

Acute Pelvic Inflammations.—Massage is contraindicated not only because of the pain occasioned by the manipulations, but more so because of the possibility of extending the infection. An infection confined to the uterus may be made to extend to the tubes; when in the tubes it may be stripped from the fimbriated end into the peritoneal cavity; when walled off in the peritoneal cavity by adherent coils of bowel and omentum the pus may be liberated and invade the free peritoneal cavity, and finally a virulent infection may be passed on by way of the blood and lymph streams to remote parts of the body. There is a special danger in massage of an infected puerperal uterus, filled as it

is with septic thrombi. These thrombi may be dislodged and conveyed to the lungs, where they cause one of the most fatal of lesions—*i. e.*, pulmonary embolism.

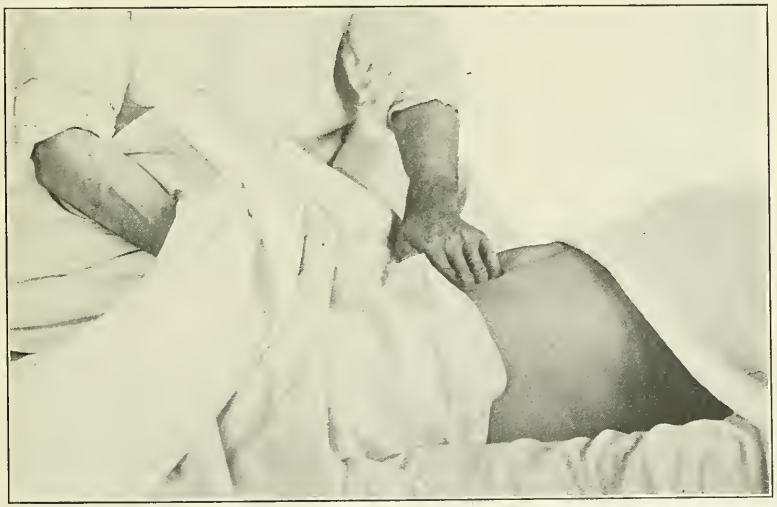
The rule should be to avoid all unnecessary manipulations during the acute stage of a pelvic inflammation.

Malignancy.—Unquestionably malignant growths are made more active and are disseminated by massage. Inasmuch as no possible good can come from massage in these cases, and much harm may ensue, the practice is condemned.

Tuberculosis of the Pelvic Organs.—This offers the same objections to massage as malignancy.

Pregnancy.—Pregnancy, both intra-uterine and extra-uterine, is to be classed with the contra-indications to massage. An exception may be made when the pregnant uterus is adherent or incarcerated. In such cases gentle manipulations may succeed in replacing the uterus, and in making the uterus freely movable, without interrupting pregnancy. When there is a possibility of tubal pregnancy all manipulation must be avoided for fear of rupturing the tube.

FIG. 98



Combined vaginal and abdominal massage. Patient lying on couch. All constriction about the waist line removed. Two fingers of the right hand within the vagina. Left hand on the abdomen.

Phlebitis and Thrombosis.—Phlebitis and thrombosis of the pelvic and femoral veins contra-indicate massage for fear of dislodging thrombi, an event which may culminate disastrously through the development of pulmonary embolism.

Technic.—Before proceeding with massage of the pelvis the rectum and bladder should be emptied, and the clothing so arranged as to eliminate all constriction of the waist, and to avoid any embarrass-

ment to the manipulations of the operator. The patient should lie upon a low-firm couch with the hips brought to the end of the couch, the legs flexed upon the thighs and the feet resting upon a chair placed at the end of the couch.

The operator sits at one side of the couch, passes his forearm under the corresponding knee of the patient, and introduces the index and middle fingers into the vagina to the vaginal vault at the point to which the massage is to be directed. No manipulations are performed by the fingers within the vagina; they are introduced for the purpose of supporting and steadying the structures to be massaged. The opposite hand, placed upon the hypogastrium, performs rotary movements, very gently at first and increasing in speed and pressure as the

FIG. 99

Abdominal massage.

abdominal muscles relax. There should be short intervals of rest and the whole sitting should not consume more than ten minutes, and should be repeated daily.

Massage of the uterus is carried out by bringing the uterus as far forward as possible by the combined efforts of the fingers within the vagina and those of the hand placed upon the abdomen. The movements are directed by the hand upon the abdomen to the posterior wall of the uterus, while the fingers within the vagina press upward and forward, and upward and backward against the cervix.

The tubes are massaged from their outer extremity to the uterine horn. The manipulations of the ovaries are similar to those of the uterus.

In massaging inflammatory exudates the operator begins at the periphery of the mass, passing around the circumference and gradually approaching the centre.

Stretching and breaking of adhesions binding the uterus and its appendages should be done without force. Undue force in breaking up adhesions, as advised by Schultze, is to be discountenanced because of the danger of hemorrhage, of tearing into an adherent bowel and of the liability of the uterus to adhere again and to resume a faulty position.

The gradual breaking and stretching of adhesions is conducted by the index and middle fingers of the left hand within the vagina, directed to the site of the adhesions. The fingers of the right hand placed upon the abdomen are made to approximate the fingers in the vagina by a series of rotary movements which, when gently performed, will cause the abdominal walls to relax and permit of deep pressure. No great pain must be caused, otherwise the contractions of the abdominal muscles will embarrass the procedure. The manipulations of the abdominal hands are at times reinforced by the fingers within the vagina, the pressure being directed on the adherent organ in such a manner as to put the adhesions on the stretch.

No rule can be formulated to govern the amount of pressure to be exerted, or to regulate the time to be consumed in breaking up the adhesions. The operator must exercise needed caution.

The replacement of a malposed uterus by massage deserves careful consideration because the procedure is in common practice throughout the medical world. Little or no success has resulted from the application of massage in pathological anteflexion. The method consists in pressing backward upon the cervix with the vaginal finger and at the same time, backward, intermittent pressure is made with the fingers of the other hand upon the fundus.

In the effort to correct a lateral position (lateroversion, lateroflexion, lateroposition), pressure is directed upon the side of the uterus. When the broad ligament is infiltrated it must be massaged independently of the uterus to favor the absorption of the inflammatory exudate.

Retrodisplacements of the uterus are particularly favorable to correction by pelvic manipulations. The index and middle fingers of the left hand make pressure upon the posterior wall of the uterus; the pressure is steady, firm, and in an upward direction. Counter-pressure is made over the hypogastrium with the other hand in the effort to grasp the fundus of the uterus. Gradually the abdominal fingers are brought behind the fundus, when by the combined efforts of the fingers over the abdomen and in the vagina, the uterus is drawn to a vertical position.

To bring the uterus more nearly to the normal position, that of anteversion and anteflexion, the fingers within the vagina are shifted to the front of the cervix, and backward pressure is made upon the vaginal portion of the cervix, while forward traction is made upon the fundus by the fingers on the abdomen. When the uterus is righted in its position, a Hodge-Smith pessary is inserted to maintain the uterus in its normal position.

As an aid to the hands in replacing the uterus, Olshausen recommends

the uterine sound. In the hands of the inexperienced this instrument is dangerous. In the author's judgment it is better to dispense with it altogether in view of the liability of puncturing the uterus, even in the hands of the most careful and experienced. When the uterus is displaced backward and is freely movable it may be possible to effect a replacement by placing the patient in the knee-chest position and introducing a Sims speculum into the vagina. The air will balloon out the vagina, the intestines will fall away from the uterus and permit it to fall forward upon the anterior abdominal wall.

As an aid to the replacement of the uterus, traction may be made upon the cervix by a vulsellum forceps. When the uterus lies far back and upon the rectum, pressure may be best directed upon the fundus by the index finger inserted high in the rectum.

In atony of the uterus resulting in uterine hemorrhage, gentle massage will cause the uterus to contract; in this manner the caliber of the bloodvessels is lessened and the hemorrhage checked.

It is said that massage of the posterior wall of the uterus at a point near the internal os will most effectually stimulate the contractions of the uterus.

Abdominal Massage.—Abdominal massage may be beneficial in conjunction with pelvic massage. This applies particularly to those cases in which constipation is a disturbing factor, or when there is a general or localized accumulation of adipose tissue in the abdominal wall, when the muscular development of the abdominal wall is poor and the recti are separated, when there is hyperesthesia of the abdominal wall, and, finally, when there are old inflammatory exudates and adhesions in relation to the abdominal wall.

Technic.—The operation should not be performed in less than two hours after eating. The patient lies upon a firm couch with legs flexed upon the thighs and the thighs upon the abdomen, the mouth open. The index, middle, and ring fingers of the left hand are laid upon the abdomen. The same fingers of the right hand make pressure upon them as seen in figure 98, and direct the fingers of the left hand in performing rotary movements as outlined in the spiral lines upon the abdomen in Fig. 99. The pressure is at first light, and after the abdominal walls are relaxed, it is increased sufficiently to affect the underlying visceral structures.

PRESSURE THERAPY

Indications
Technic

The so-called "absorption cure" as applied to certain chronic inflammatory diseases of the pelvis was introduced by W. A. Freund. The absorption of pelvic exudates is facilitated by means of pressure applied directly to the exudate. A bag containing several pounds of shot is placed over the abdomen and a rubber condom, filled with 800 to 1000 grams of shot, is inserted into the vagina and impinges upon the exudate. Freund reports excellent results in the treatment of fixed

retroverted uteri, salpingitis, acquired and congenital narrowing of the vagina.

Other methods have been introduced, based upon the same general principle. Chrobak practised traction massage by applying a weight of one to one and a half kilograms to the cervix, making traction for one-half to ten hours. Saenger advised interrupted traction on the cervix. Pincus used a shot-bag over the abdomen and an air pessary or air-bag in the vagina. This method is based upon the theory that the pressure from without was of prime importance, and the air-bag or pessary within the vagina was merely to support the uterus. Freund, however, laid greater stress upon intravaginal pressure.

An important modification of Freund's method was introduced by Joseph Halban. In place of a rubber condom filled with shot, he used a Carl Braun's colpeurynter filled with quicksilver. This modification has a twofold advantage, in that it is easy of application, and a greater and more evenly applied pressure can be obtained with the same bulk in the vagina. A pressure of 1500 grams of quicksilver is possible by this method, a pressure that is altogether impossible in Freund's method. Then, too, quicksilver in the colpeurynter moulds itself more perfectly to the exudate than is possible for a bag of shot.

Indications.—Pelvic Cellulitis.—This treatment is particularly effective by reason of the location of the lesion. The exudate is found most frequently in the cul-de-sac of Douglas, or in the base of the broad ligament, where direct pressure can be exerted. The whole vault of the vagina may be surrounded by a stone-like mass, suggestive of malignant infiltration; the uterus and adnexa may be lost in the mass, and yet after two or three treatments the size of the mass may be so decreased that the uterus and its appendages can be clearly outlined. The rapidity with which these results are obtained can only be accounted for on the supposition that the bulk of the mass is largely composed of serous exudate which rapidly disappears on pressure, leaving a greatly reduced cellular exudate. It has been frequently observed that the subjective symptoms do not always disappear in proportion to the decrease in size of the exudates. In the treatment of retro-uterine exudates, Halban tried introducing the colpeurynter into the rectum, but found this method impractical because of pain, and of the more direct pressure upon the rectum rather than upon the pelvic exudate.

Perimetritic Exudates.—In perimetritic exudates the effect of pressure is not so satisfactory because of the higher location of the exudate. When the adhesions are high on the fundus of the uterus little pressure can be directly exerted. Pelvic massage or the more radical operative procedures are preferred. When the exudate is located low on the pelvic floor the adhesions commonly disappear early and there is relief from pain. When the uterosacral ligaments are involved in a chronic inflammation they become contracted and throw the uterine body forward. The patients complain of painful coition, and a similar pain is caused by the drawing forward of the cervix, though the uterus itself and its appendages are not sensitive to pressure. A colpeurynter filled

with quicksilver placed behind the cervix will so stretch the uterosacral ligaments as to give most satisfactory results in correcting the contraction of the ligaments and in relieving the pain. When the uterine appendages are involved, the results of pressure therapy depend largely upon the position of the diseased appendages. If in a normal position intravaginal pressure cannot be effectively applied, but if the tubes and ovaries lie low in the pelvis, as is often the case, direct pressure may be applied with telling effect.

It is impossible, in all cases, to foresee the presence of a virulent infection which may lie latent in the adnexa. Great caution must therefore be exercised in applying such energetic treatment for fear of exciting an acute exacerbation of a chronic inflammation. This is particularly true of gonorrheal infection. It is well known that the size of the adnexal tumors is not proportionate to the pain caused, and so it is with the treatment, the inflammatory exudate may be greatly reduced in size with little or no relief from pain; on the other hand, the exudate may be but little reduced in size and the pain wholly disappear.

Fixed Retroverted and Retroflexed Uteri.—It is in the replacement of fixed retroverted and retroflexed uteri that pressure therapy gives the most brilliant results. In Schauta's clinic it is now rarely found necessary to anesthetize a patient in order to replace a fixed retroplaced uterus. The colpeurynter placed behind the cervix crowds the uterine body forward, favors the stretching and absorption of adhesive bands, and at the same time the posterior vaginal wall is put upon the stretch and tends to draw the uterus forward.

Incarcerated Pregnant Uterus.—The Halban method has been lately advised in the treatment of incarcerated pregnant uteri. Halban reports success in a single trial, and says it is not advisable to make more than two or three efforts at replacement by this method. He has given 30 to 40 treatments in a single case and observed no progress after the first two or three treatments. Incarcerated pelvic tumors may be treated by the same method if located low in the pelvis.

Pressure therapy is not recommended as a substitute for massage in all cases. There are cases in which massage is preferable, as for example in adhesions attached to the fundus of the uterus, or involving normally placed appendages; but in the majority of instances the Halban procedure is more convenient of application and the results are more quickly gained, requiring days where pelvic massage may require weeks, and even months.

Technic.—In applying this method the patient is placed either upon her back or side; on her back if the exudate lies behind the uterus; on the corresponding side if the exudate lies to the side of the uterus. The colpeurynter is rolled like a cigar, smeared with vaseline, and introduced into the vagina by a dressing forceps. It is placed in direct contact with the exudate. The foot of the bed is raised and additional elevation gained by pillows placed under the hips. The bladder and rectum must be empty, otherwise some discomfort will be caused when the bag is filled. The colpeurynter is now filled with quicksilver, poured through

a funnel. At first it is well to use not more than 500 grams, and later to increase the amount to 1000 grams. Were the patient lying on a level plane the pressure would be largely applied to the rectum, while with the hips elevated the pressure is in great part applied to the vagina and uterus. Halban uses one to three pounds of shot for counter-pressure over the abdomen; when the patient lies on the side the bag of shot is retained in place by adhesive straps. This pressure is continued for not less than an hour, and may be prolonged throughout the entire day.

When pain is caused by the pressure of the quicksilver a part or all of it must be removed without delay. The danger of continuing the treatment lies not alone in the discomfort, but in the liability of exciting an acute exacerbation of a subacute or chronic inflammation, and in the dissemination of an unrecognized virulent infection.

In the diagnosis of pelvic exudates it is not always possible to exclude the presence of a virulent infection, hence it is well to proceed with caution by first using not more than 500 grams, and this for but a short time, to be repeated the following day with a larger amount and for a longer period. If pain is caused the treatment is discontinued, and for a few days, rest, hot douches, and like conservative methods are substituted, to be then followed by a repeated trial of the pressure therapy. If pain is again caused the treatment should be abandoned for other conservative methods.

ELECTRICITY

Little need be said of electricity as a therapeutic agency in the treatment of diseases of women. It has been extolled as a panacea for almost all afflictions of women. One by one these diseases have been removed from its category until now little place is given to the consideration of the subject in text-books or periodicals, and few gynecologists find any place for electricity in the treatment of diseases of women. Electricity in gynecology has had its day and now finds no place in rational gynecological therapy. No consideration will therefore be given to the subject in this text.

X-RAY THERAPY

There is a limited scope for the application of the *x*-rays in the treatment of gynecological diseases. The lesions which are amenable to this form of treatment are either rare, are seldom recognized early enough to insure success, or else are inaccessible to the influence of the rays. There are, however, selected cases in which the *x*-rays are of special value.

Indications.—Cancer.—*Cancer of Uterus.*—Cancer of the uterus in its earliest stages never calls for *x*-ray treatment, but demands a radical

surgical procedure. Only inoperable cancers of the cervix and recurrent cancerous growths after hysterectomy call for a consideration of such tentative measures. The treatment is in no sense curative; at most it can only clear up the superficial lesions and thereby stay the discharges. Little or nothing is accomplished in relieving pain because of the impossibility of reaching the infiltrated areas in the deep-lying structures. Insofar as the *x*-rays check the wasting discharges they promote nutrition, and if they serve no other purpose than to encourage the patient, they are not without value.

In one instance a recurrence of a cancer of the cervix occurred one year after hysterectomy. The author removed a growth the size of a hazel-nut from the vault of the vagina and in five days it had returned to double the original size. The growth was again excised and cauterization applied as deeply as seemed safe. During the following year the *x*-rays were applied; at first three times a week and later at longer intervals. There has been no sign of recurrence in the ten years following the last operation.

The author is of the opinion that the *x*-rays should be applied to the vault of the vagina after convalescence from hysterectomies done for cancer of the cervix. When properly applied they can do no harm and may do good.

Cancer of the Vagina and Vulva.—Cancers of the vagina and vulva are more accessible to the application of the *x*-rays, and are slower in their spread than cancers of the uterus. The results from the application of the *x*-rays are therefore better than in cancer of the cervix. The treatment is usually only palliative, but in some instances it is curative. It is not to be understood that the *x*-rays in any instance should replace surgery when the lesion is operable, but should be applied as a supplementary procedure after a surgical operation and the healing of the wound. In inoperable cancer of the vulva and vagina much may be done with the rays to promote comfort and to prolong life.

When a cure appears to have been effected it is advisable to continue the applications of the rays at intervals of weeks or months for a period of several years, if not for the entire life of the individual.

Sarcoma.—The same rules should apply to sarcoma as to carcinoma, though the results are less certain.

Tuberculosis.—In tuberculosis of accessible regions of the genitalia the *x*-rays have produced most gratifying results. The response to the treatment is usually prompt and a complete cure may be expected in a few weeks, even in cases which have advanced to ulceration. Failure to obtain good results is largely accounted for by faulty technic in the application of the rays, and in not recognizing the presence of the lesion in the upper genital tract, beyond the reach of the rays.

Pruritus Vulvæ.—A number of successful cases have been recorded in which the rays have been applied to the itching area. When other means have failed the *x*-rays should be given a trial.

Eczema.—In the chronic indurative stage, eczema usually responds very promptly to the influence of the *x*-rays. Other modes of treatment

may be combined with their application. The itching will usually cease after a few treatments.

Lichen Planus.—This is rarely seen on the vulva. The *x*-rays deserve a trial in such cases, but the results are uncertain.

Osteomalacia.—Osteomalacia has been successfully treated by the *x*-rays. The results are obtained by producing atrophy of the ovaries. It must be borne in mind that in the application of the *x*-rays sterilization and the artificial menopause may be brought about through atrophic changes in the ovaries. This fact has led to the application of the rays in cases in which it is desired temporarily to check or permanently to do away with the menstrual flow by directing the rays to the ovaries.

Menorrhagia.—Menorrhagia due to chronic metritis, subinvolution, uterine fibroids, and muscular insufficiency of the uterus has been controlled by repeated applications of the rays. The effect is to destroy the functionating capacity of the ovary and in time to cause atrophy of the ovaries.

Uterine Fibroids.—Experiments on animals have demonstrated that marked changes are produced in the ovaries by the action of the *x*-rays. There is degeneration of the follicular epithelium, death of many of the ova, sclerosis of the bloodvessels, and finally disappearance of all follicles. The follicles are replaced by hyaline tissue. Similar observations have been made on the human ovary. Small hemorrhages have also been noted in the ovarian cortex. In myomata, nuclear degeneration and cellular destruction have been observed, together with minute hemorrhages.

Jaugeas believes that the *x*-rays should be applied to cases in which there are multiple small fibroids scattered in the uterine wall. They may also be used when the tumor is large and does not give rise to symptoms demanding immediate relief. Old slow-growing tumors are not much influenced by the *x*-rays. Jaugeas applies the rays alternately over either ovary and the uterus. Special caution must be exercised when the abdomen is heavy with fat for fear of producing necrosis. Gauss is of the opinion that hemorrhages can be controlled in every instance by repeated applications of the *x*-rays; these should be made at frequent intervals and over a period of not less than two months.

When the ovaries lie behind large tumors no results will be obtained by the action of the rays. Whenever degenerative changes are suspected in the tumor no time should be lost in applying the rays; such cases are preëminently surgical.

SWABS

Indications
Technic

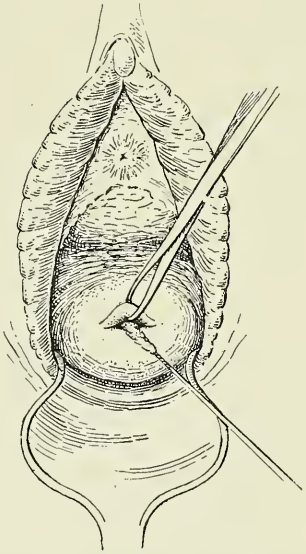
There is only a limited field of usefulness for the uterine swab. Too much needless and even harmful use has been made of the swab in office practice.

Indications.—The swab has a legitimate field of usefulness in:

Removal of Mucus from the Cervical Canal.—Before making topical applications to the cervix and to the endometrium, the mucous secretions which cling tenaciously to the cervical mucous membrane should be removed by means of an applicator of absorbent cotton. Sterility is sometimes due to a plug of mucus in the cervix, and pregnancy has been known to follow upon the removal of such a plug. Before making applications to erosions of the cervix the surface should be cleansed by swabbing with sterile absorbent cotton on a dressing forceps.

Application of Escharotics and Antiseptics to the Cervix and Endometrium.—Much harm has been done by the application of too strong escharotics and antiseptics to these surfaces. It may be further charged that too often these applications are made when there is no indication for their use. There are but two indications for such applications, *i. e.*, hemorrhage in which styptics are occasionally applied and chronic infection.

FIG. 100



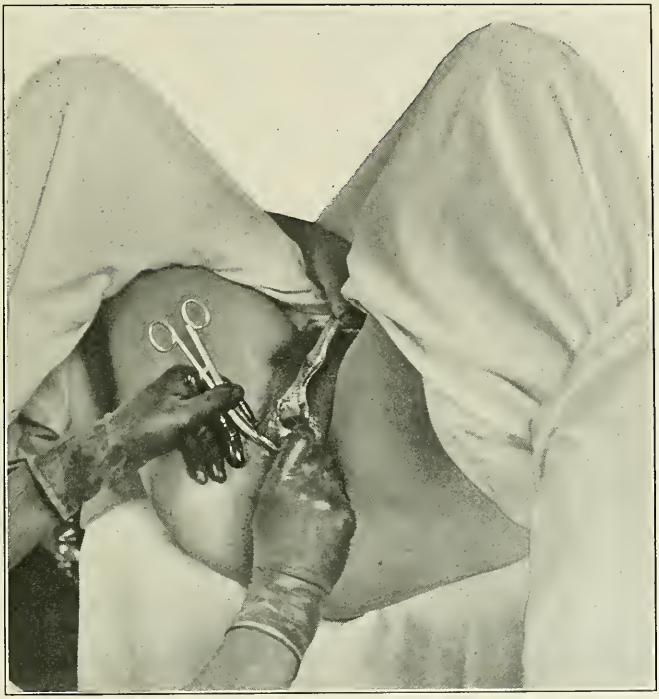
Topical application to the cervix by means of a swab.

Technic.—The patient is placed in the lithotomy or Sims' position and the cervix exposed by a bivalve speculum in the former position and by a Sims' retractor in the latter position.

When it is necessary to dilate the cervix this may be done under anesthesia or by means of laminaria or tupelo tents. For convenience the author is in the habit of using small wooden applicators on which a film of absorbent cotton is tightly wrapped. These are sterilized and kept in a sterile receptacle. A dry swab is first inserted to remove the mucus, and this is followed by one or two medicated swabs. For infec-

tion of the cervix the author usually employs pure formalin or a 5 per cent. solution of zinc chloride. Without an anesthetic it is needless to attempt to swab the endometrium.

Fig. 101



Swabbing the cervix. The cervix is exposed by a retractor held by an assistant. The cervix is grasped by a tenaculum and swabbed with a sterile probe wrapped with sterile absorbent cotton.

SERUM AND ORGANOTHERAPY

Much interest has been manifested during recent years in the serum treatment of gynecological diseases, but as yet no definite results have been obtained.

Antitoxin of Diphtheria.—The one exception to the above statement is in respect to the antitoxin of diphtheria. In diphtheritic vulvovaginitis a prompt reaction will usually follow the administration of antitoxin. The rarity of true diphtheritic infection of the genital tract, and particularly in the non-puerperal state, provides little justification for the consideration of this most valuable serum in this text.

Ovarian Extract.—Ovarian extract has been recommended in cases of premature menopause, whether from unknown causes or from the removal of the ovaries. It is said to replace the lost internal secretion of the ovary, which has a controlling influence upon the general

metabolism, and nervous equilibrium of the individual. The author's experience with the remedy in a large number of cases has never satisfied him that it is of any special value.

Corpus Luteum Extract.—Corpus luteum extract is the desiccated powder of the ovaries of pigs put up in capsules holding 5 grains in each. It has proved of great value in the author's hands in controlling the nervous manifestations incident to the artificial menopause. He believes it should always be given shortly after an operation in which the ovaries have been removed and continued for a period of at least three months. The dose is 5 grains three times daily. Not only does the corpus luteum extract lessen and often forestall the nervous disturbances of the superinduced menopause, but the author has observed cases in which sexual desire had been lost for one or more years after the removal of the ovaries and was restored by the administration of corpus luteum extract. More than this, it happens in a small percentage of cases in which the ovaries have been removed that the menstrual cycle will proceed as long as corpus luteum extract is given. It is sometimes possible to reëstablish the menses by the administration of corpus luteum even after a period of amenorrhea of twelve to eighteen months following the removal of both ovaries. The author has had good results in about three-fourths of the cases of the artificially induced menopause, but he has had little success with the corpus luteum extract in the management of the natural menopause.

Thyroid Extract.—Thyroid extract has been advocated for the treatment of fibroid tumors of the uterus on the assumption of the reciprocal trophic relationship existing between the thyroid gland and the uterus, as demonstrated by the occasional occurrence of uterine atrophy after thyroidectomy, of menstrual disorders in goitre, in cretins, and in myxedema, and by the occasional atrophy of the thyroid gland following hysterectomy. Few clinical observations have been made to support this hypothesis, and consequently no conclusions are yet possible.

Pituitrin as a Styptic in Gynecology.—Much has been written recently concerning the use of the extract of the hypophysis (pituitrin) as an oxytocic and hemostatic in obstetric practice, but there has been little said of its application in gynecology. Bab extols its use as a hemostat in uterine hemorrhages due to metritis and inflammations of the adnexæ. He obtained good results in 94 per cent. of his cases. In some of these instances, ergot, hydrastis, and stypticin had failed. A subcutaneous injection of 2 to 3 c.c. was given.

Gonorrheal Vaccine.—See chapter on Gonorrhea in Women.

Tuberculin.—See chapter on Tuberculosis in Women.

Vaccine Treatment of Pelvic Infections.—There is little encouragement in the vaccine treatment of either acute or chronic pelvic infections. Polak obtained encouraging results in the treatment of 225 cases, both puerperal and non-puerperal. His best results were obtained when the infection was localized in the absence of a bacteriemia. He employs the mixed vaccine obtained from reliable laboratories. The initial dose given was 25,000,000 to 100,000,000 organisms.

CHAPTER XII

HYGIENE AND DRESS

Hygiene of the School-girl
Physical Training in Schools
Public Playgrounds and Baths
Indoor Exercise
Dress

Hygiene of the School-girl.—It is encouraging to note that the public school, which was primarily established for the development of the mind of the child, is enlarging its scope and is today giving serious consideration to the development of the body. As a result the children of the poor find conditions in the school more favorable to their physical development than in their homes. Up to the time of puberty there should be no distinction made between the work and play of the girl and the boy. It is at this time of life that the child should acquire fixed hygienic habits and in this the home and the school should coöperate. The hours of play and of rest, the food and the clothing, are matters of such vital importance as to engage the combined efforts of parents and teachers. The child who comes to school without sufficient clothing and without breakfast, and who has neglected the morning bath, as well as the care of the hair, the teeth and nails, is more in need of instruction and assistance in the care and development of the body than of the mind. Means for giving the needed service should be at the command of the teacher.

The modern school-girl is dressed in an ideal way. The dress combines lightness with warmth, there is an absence of constriction at the waist line, the clothing is evenly distributed and hangs from the shoulders, and the shoes are heavy and comfortable. It would be well if such a dress were not discarded in later years.

The importance of medical inspection of the pupils cannot be overestimated. Many children are physically disqualified for receiving school instruction, and it is at this time that many defects can be remedied which if left uncorrected and unrecognized would lead to permanent disability. Children who are underfed, who have adenoids, defective vision, and scoliosis are placed at an immense disadvantage in their education. It is estimated that 90 per cent. of children who are backward in their lessons are physically defective. More than half the children who enter the public schools are in need of medical attention, and it may be affirmed that these ailments, if allowed to exist, will engender in girls many of the pelvic disorders which become manifest with the establishment of puberty. The underfed child cannot assimilate knowledge. "Good nutrition, therefore, is essential to good education." It would be well if the public schools in this country would

follow the example of some of the European schools in providing breakfast and luncheon for the underfed child.

Thomas Madden Moore is quoted as saying: "If the State, for reasons of public policy, determines that all children shall be compulsorily educated from their earliest years, it should certainly afford the means by which this may be least injuriously and most effectively carried out, by providing sufficient food as well as education for every pauper child compelled to attend school."

It must not be inferred that malnutrition is the heritage of the poor alone; the child of the well-to-do may suffer from the lack of plain, nourishing food and an oversupply of sweets and pastries.

The school desk is an important factor for consideration. A faulty attitude assumed by the child at the desk leads to many physical defects which may have an important bearing in later life.

Physical Training in Schools.—The effect of physical training in schools is apparent to all who have had opportunity for observation. This effect is not only manifested in the physical development of the child, but in the mental development as well. Regular systematic gymnastics should be a part of the curriculum of every public and private school, and should be demanded of the children of the rich as well as of the poor. Such exercises not only benefit the child of normal development, but will correct many of the physical defects due to faulty posture and carriage. The gymnasium is of special value to the girls because of the greater difficulty experienced in having them take the needed outdoor exercises. There should be no distinction made between the exercises required of the girls and that of the boys before the age of puberty. Up to this time there is no essential difference in their physique, and the demands for their development are identical. The girls should be encouraged to spend several hours a day in the open air in their sports.

Public Play-grounds and Baths.—No greater boon has been conferred on the children in large cities than in the establishment of public parks, play-grounds, and baths. Children of the crowded tenement districts who live in poorly lighted rooms are afforded the opportunity for fresh air, sunlight, and healthful exercise. More than this there is a watchful control exercised over these children which safeguards them from injury and develops manly and womanly qualities in them. It would be well if public laundries were also established in crowded tenement districts.

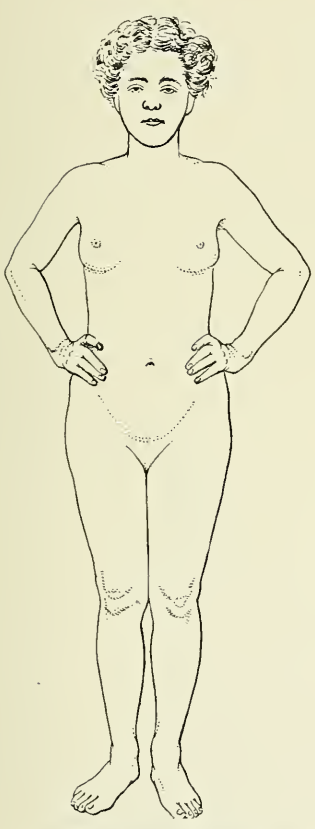
All these conveniences are not mere luxuries, they are absolute necessities, if the right sort of wage-earners, wives, and mothers is to be developed. The public purse can well afford to make adequate provision for them.

Indoor Exercise.—Whatever adds to the general physical development of women adds to the sexual development, and should be encouraged. Both indoor and outdoor exercises are more appreciated today than at any time in the history of the American race, and to this fact may be ascribed much that has contributed to the well-being

of women. Golf, tennis, riding, and other forms of exercise, when judiciously practised, produce a healthy, vigorous type of women, and in this general improvement the sexual organs share.

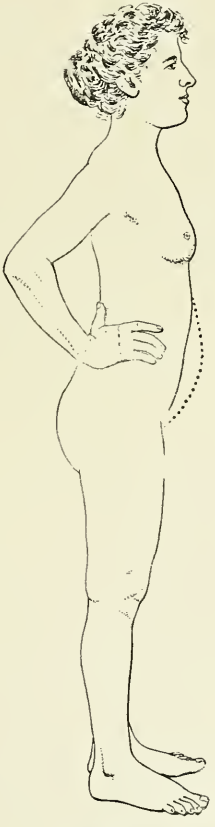
Indoor exercises are of value as adjuncts to the treatment of diseases of women. The capacity of the lungs and the development of the muscles of the thorax and abdomen have much to do with the equilibrium of the circulation in the pelvic organs. Hence it follows that whatever exercise will develop the capacity of the lungs and the strength of the abdominal and thoracic muscles will tend to prevent displacement of the uterus and congestion of the pelvis.

Fig. 102



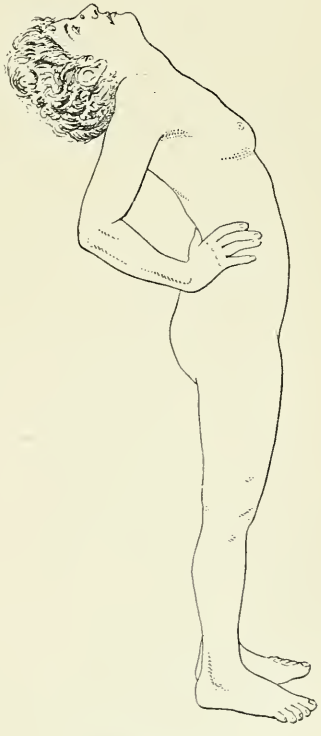
Deep breathing. The shoulders and chest elevated.

Fig. 103



Contractions of the abdomen.

Fig. 104

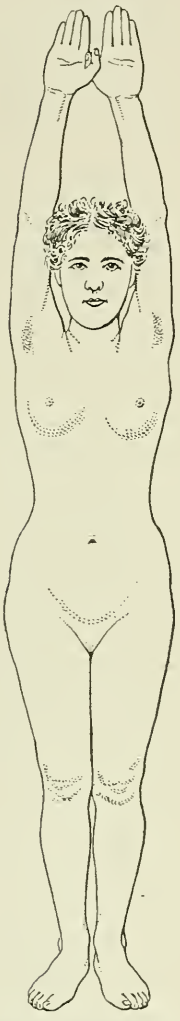


Bending backward of body.

Women of advanced years are especially in need of such exercise. Inasmuch as they are less inclined to physical activity their muscles become relaxed and atrophied, fat accumulates in the abdominal wall and omentum, and there is a tendency to the development of a pendulous abdomen. Such a condition predisposes to uterine displace-

ments and pelvic congestion with all their attending evils. It must not be assumed that the accumulated fat is the offending factor, nor must efforts be directed solely to reduction in weight, but rather to strengthening the retaining power of the abdominal wall by increasing the muscular tone through well-directed exercises.

Fig. 105



Bending forward of body. First step.

If indoor exercise is to afford the best results certain conditions must be maintained; the clothing must be free of constriction—pajamas are preferred; the room must be supplied with an abundance of fresh air, yet free of drafts; the bowels, bladder, and stomach must not be loaded, and finally the exercise should be taken in the morning before breakfast and in the evening before retiring. Moreover, it is essential that the exercises should be taken at regular intervals and not be subject to the whims and moods of the individual. They should not be carried to the point of fatigue, and after the exercise in the morning, while the circulation is yet accelerated, a cold bath or shower should be taken, followed by vigorous rubbing of

Fig. 106

Bending forward of body. Second step.

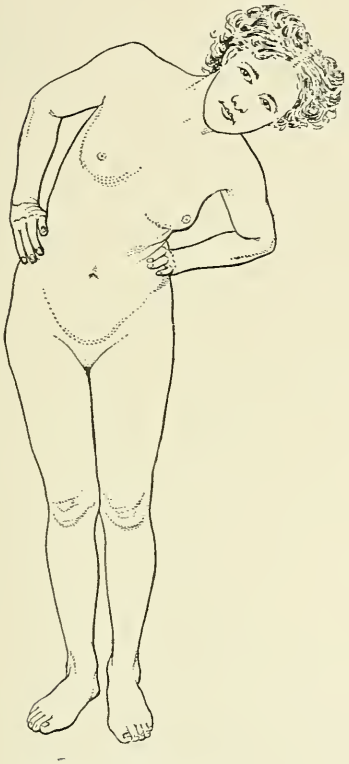
the body with a coarse towel. After the evening exercise a full hot bath should be taken and the body dried with a soft towel and the patient should then retire to bed.

There are certain movements which are especially directed toward the object desired. Those in general practice are the following:

Exercise 1.—*Deep Breathing.*—The erect posture is assumed with the hands resting upon the hips, the arms akimbo. The chest is slowly expanded to the full capacity of the lungs. The air is held for a few seconds, with the abdominal muscles tightly contracted, then slowly and completely expelled. This exercise should be repeated six times in a minute.

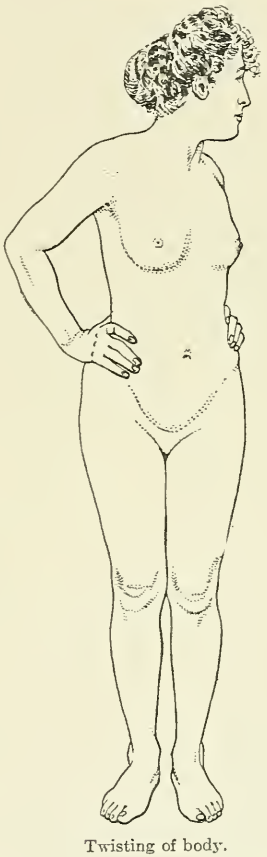
Exercise 2.—*Abdominal Contractions.*—The erect posture is assumed with the hands resting upon the hips, the arms akimbo, the abdominal muscles alternately contracted and relaxed.

FIG. 107



Bending of body sidewise.

FIG. 108



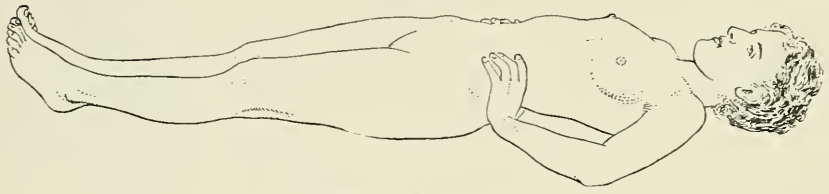
Twisting of body.

Exercise 3.—*Trunk Bending Forward.*—The erect posture is assumed, the arms are stretched vertically above the head, the palms facing forward, and the thumbs interlocked. The chest is slowly expanded to the full capacity of the lungs, the abdominal muscles are contracted tightly, and then the trunk is bent upon the hips without bending the knees, in the effort to touch the tips of the fingers or the palms of the hands to the floor. A deliberate return is then made to the erect

posture, and while the arms are being slowly lowered to the side the air is exhaled. There should be an interval of ten seconds before the exercise is repeated.

Exercise 4.—*Trunk Bending Backward.*—The erect posture is assumed, the hands resting upon the hips and the arms akimbo. Under full expansion of the chest and firm contraction of the abdominal muscles, the body is slowly bent backward, then gradually straightened again and the air exhaled.

FIG. 109



Raising of body. First step.

FIG. 110

Raising of body. Second step.

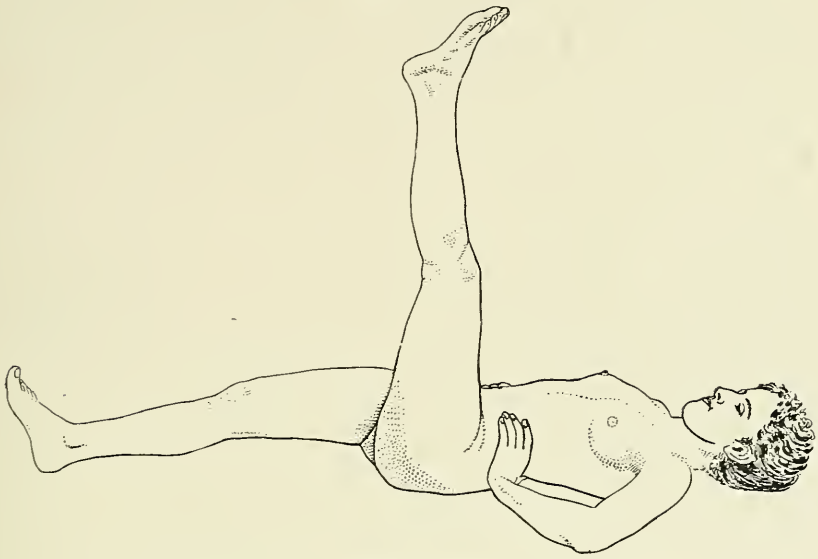
Exercise 5.—*Trunk Bending Sidewise.*—The erect posture is assumed with the hands resting upon the hips, the arms akimbo. The chest and lungs are fully expanded and the abdominal muscles contracted. The trunk is then slowly bent to the right and to the left several times in succession.

Exercise 6.—*Trunk Twisting.*—The erect posture is assumed, the hands resting upon the hips, the feet close together, the legs and thighs rigid. The chest and lungs are fully expanded, the abdominal muscles tightly contracted. The body and head are then repeatedly rotated from left to right and from right to left.

Exercise 7.—*Trunk Raising.*—The body lies straightened upon the floor, the hands resting upon the hips, the feet together, a full breath

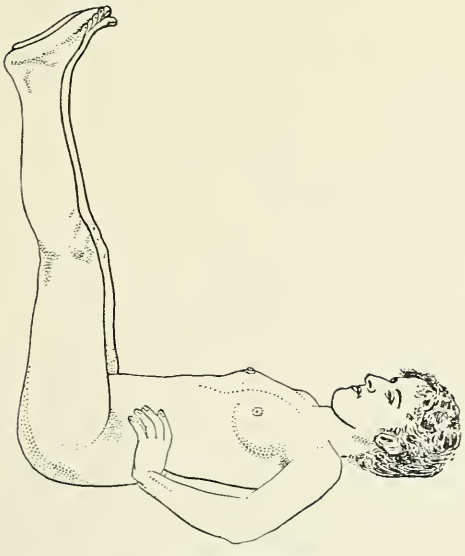
is taken and then the body is slowly raised to the sitting posture. The original posture is then slowly resumed as the air is exhaled. There should be a rest of a few seconds before repeating the exercise.

FIG. 111



Raising one leg.

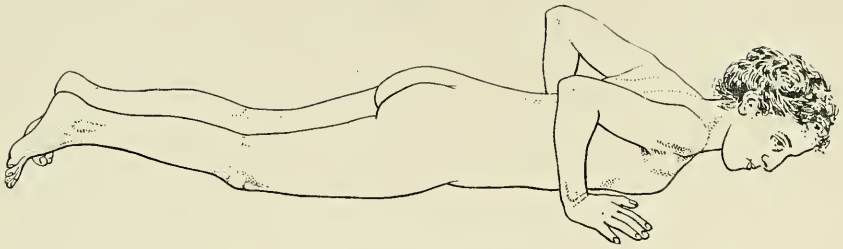
FIG. 112



Raising both legs.

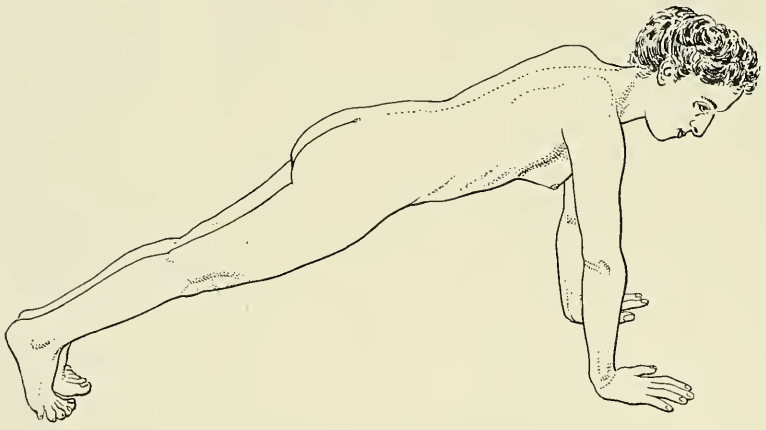
Exercise 8.—*Leg Raising.*—The same posture is assumed as in Exercise 7. Then with the lungs fully expanded and the knees stiffened,

FIG. 113



Dip movement. First step.

FIG. 114



Dip movement. Second position.

FIG. 115

Squatting position.

the legs are slowly elevated to a right angle with the trunk; as they are lowered the air is exhaled. This exercise is repeated at intervals of a few seconds. If difficulty is experienced in elevating both legs together they may be elevated alternately.

Exercise 9.—*The Dip Movement.*—Lying prone upon the face and abdomen with the palms and toes upon the floor, the back, neck, and legs stiffened, a full breath is taken. The whole form is elevated upon the arms and toes, then lowered as the air is exhaled.

Exercise 10.—*Squatting.*—With deep inspiration in the erect posture, the hands resting on the hips, the patient squats so that the buttocks are close to the heels. She then straightens up and exhales. This movement is repeated at intervals of ten seconds.

Dress.—Faulty habits of dress are responsible for many of the ailments of women. The chief faults are combined in the insufficient protection from dampness and cold and in undue constriction and traction about the waist. As a result of insufficient protection the surface of the body becomes chilled, and the internal organs, particularly those of the pelvis, become congested, their functions deranged and their texture altered. The pernicious habit of wearing thin-soled shoes and sleeveless, low-necked gowns contributes largely to the disorders of the pelvic organs.

Three essentials to dress are emphasized by Dudley, whose views are in accord with the classical paper of Dickinson.[1]

These conditions are:

1. Even distribution for uniform protection against cold and wet.
2. Freedom from waist constriction.
3. Freedom from traction.

1. **Even Distribution.**—In this respect the modern dress displays an utter disregard of hygienic principles. No adequate protection is afforded the head; the neck, shoulders, and arms are either bare or insufficiently clad; layer upon layer of cloth bind the waist; skirts hang about the lower extremities, but provide little warmth and do immeasurable harm by traction and constriction of the waist; the legs are poorly protected by stockings; and tight shoes with thin soles hamper the free action of the feet and expose them to cold and dampness. High heels tilt the body forward, thus putting undue strain upon the muscles of the back and contributing to backaches and fatigue in the effort to maintain the equilibrium of the body. More than this, the normal curves of the spine and the obliquity of the pelvis are altered.

2. **Waist Constriction.**—By constricting the waist with corsets and bands the muscles of the abdomen and back are seriously embarrassed, the abdominal viscera are displaced and their functions impeded; the inability to perform abdominal respiration impedes the action of the lungs and heart. Passive congestion of the abdominal and pelvic organs may result from waist constriction, and, as a consequence, the menstrual functions become deranged, discomfort is complained of in the pelvis and the capacity for childbearing is limited if not wholly lost.

[1] Trans. Amer. Gyn. Soc., 1893.

Furthermore, the stomach is compressed and its functions impaired. The peristaltic movements of the bowel are embarrassed, leading to constipation and intestinal indigestion. The transverse colon and kidneys are crowded downward. In short, there is not a single viscus in the chest, abdomen, or pelvis which may not be affected directly or indirectly by the constriction of the waist.

While it is apparent that the corset is capable of much harm, it must in all fairness be admitted that a corset may be so made and adjusted that it will do no harm and be a benefit in certain particulars. This statement should be qualified, however, for in women who are compelled to assume the stooping posture day after day in their work, any sort of a corset will compress the abdomen.

FIG. 116

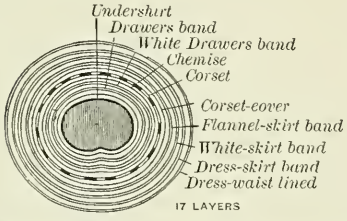
Forward bending. Corset steels forcing the pelvic organs downward. (Steele-Adams.)

It is estimated that a woman who draws in her stays three or four inches places herself under a direct pressure of from twenty to thirty pounds' weight, and that this pressure is increased by the food and liquids taken into the stomach, by the loading of the bowel, and by the weight of the skirts (Playfair).

During pregnancy, constriction of the waist is particularly apt to produce displacements of the uterus, and may be the cause of abortions and malpositions of the fetus.

At this juncture it may be well to refer to the abdominal supporters worn in the childbed period. Such a binder, when tightly applied, operates in an injurious way by increasing the intra-abdominal pressure, and thus contributes to the congestion of the uterus. Unquestionably, not a small percentage of displaced uteri are accounted for in this way.

FIG. 117



Layers of material about waist in old style of dress. (Dickinson.)

FIG. 118

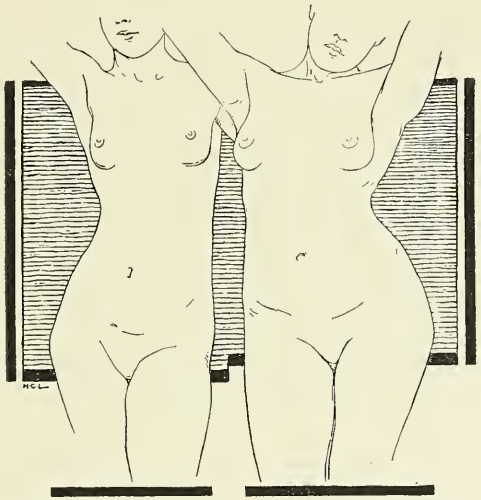
Layers of material about waist in new style of dress. (Dickinson.)

A flabby uterus, slightly supported by the relaxed ligaments and pelvic floor, affords little resistance to the intra-abdominal pressure, but the author would not be understood as condemning the wearing

of all abdominal supports after labor. When the abdominal walls are greatly relaxed, a properly adjusted binder will provide the needed support to the viscera and add to the comfort of the mother.

3. **Waist Traction.**—Corsets and waist-bands prevent the free exercise of the abdominal and dorsal muscles. This leads to an underdevelopment of these muscles. They are unable to withstand the weight of the skirts without fatigue. In this fact lies one explanation for the habitual backache of women. Moreover, the underdevelopment of the muscles of the abdomen weakens the expelling powers of labor. Hence it follows that all unnecessary traction at the waist must be eliminated.

Fig. 119



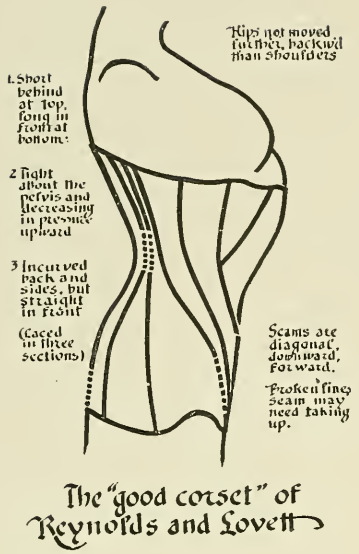
Body forms that are factors in questions of corset postures and pressures. A thin build shows a long trunk seriously affected by constriction during adolescence. A square build and broad trunk may be squeezed to develop fat pad deformities, but rarely into displacements or serious defects. (Dickinson.)

To meet the conditions necessary to provide even distribution for uniform protection against cold and wet, together with freedom from waist constriction and traction, Dudley recommends a hygienic dress composed of the following garments:

1. Union undergarment.
2. Equestrienne tights (in winter).
3. Muslin or silk waist and skirt.
4. Dress in one piece, or so made that its principal weight may be distributed over the shoulders, bust, and hips. These garments may be modified in many ways to suit the fancy without violating the essential principles—that of even distribution and freedom from waist constriction and traction.

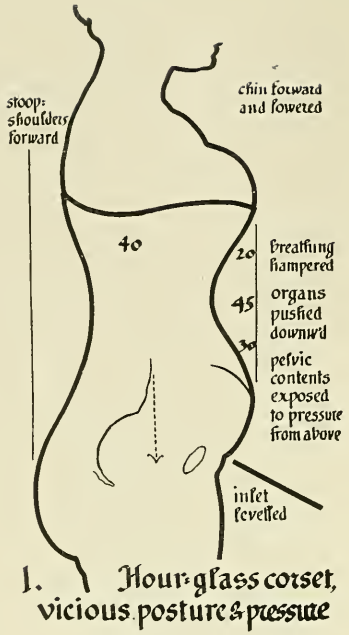
Corsets.—In a series of observations made by Dickinson upon the construction and physical effects of the corset, he finds that the average

Fig. 120



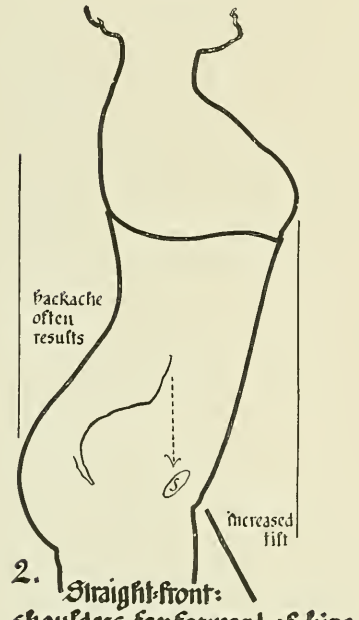
The "good corset" of Reynolds and Lovett

Fig. 121



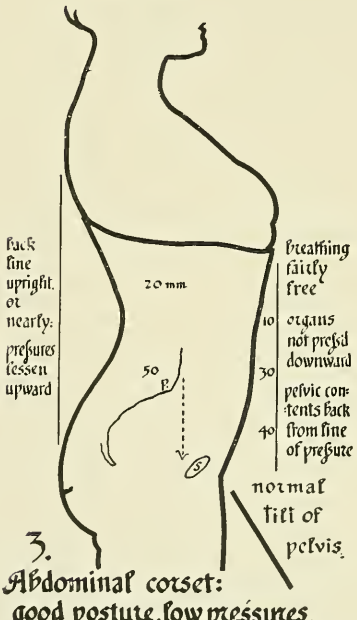
1. Hour-glass corset, vicious posture & pressure

Fig. 122



2. Straight-front: shoulders far forward of hips

Fig. 123



3. Abdominal corset: good posture, low pressures.

Figs. 121, 122, 123.—The three types of corset, hourglass, straight, abdominal. Vicious pressures compared with tolerable pressures; harmful forms *vs.* neutral; bad posture or good; pelvic inclination inviting displacement as against tilt which saves from pressures. Picturesquely unfavorable instances of the first and second class are here selected to contrast with a good or corrective example of the third. (Dickinson.)

PLATE XIII

Simple Method of Recording Outlines.

Against a heel bar the subject stands. The paper is clipped to wall or drawing board. A pencil, held by elastics in the groove of a narrow book that acts as a square, follows the profile and makes a tracing. The knee action is shown by the snug sheet. Dickinson.)

corset shows little effect on increase in the vaginal pressure in corseted women whose abdominal walls and pelvic floor are firm, but they cause a marked rise in the intrapelvic pressure from exertion in women whose muscles are flabby and whose interior supports are relaxed. Dickinson is of the opinion that the tight corset does little harm to vigorous women, and great harm to weak women.

The woman with a long body, compressed chest, and sagging viscera is harmed by corsets. Dickinson attempts to group the various types as follows:

1. A limited number of women who are not seriously affected by excesses in pressure and constriction.
2. A large number of women who are not seriously affected by moderate degrees of constriction.
3. A large number of women in whom abdominal constrictions gradually induce considerable alterations which may result in permanent disability.
4. A small proportion of women who are seriously affected by slight departures from the normal.

To estimate the amount of pressure exerted by the corset, note the gap between the steels on loosening the corsets; this gap should not be greater than two inches. The hand passed within the corset will locate the respective points of pressure and will roughly indicate the degree of pressure.

Effect of Corsets upon Posture.—We have observed the effect of faulty posture upon backstrain and have referred to this factor as a frequent cause of backache. Corsets may correct or exaggerate a faulty posture, hence relieve or increase backache.

Dickinson finds that the normal posture calls for a line from the back of the buttocks to the back of the shoulders that inclines forward about one inch, *i. e.*, the shoulders are about one inch in front of the buttocks.

Office Test of Posture.—Dickinson stands the patient on a mark on the floor, sidewise to a paper on the wall, when the shoulder-blade and buttocks are indicated on the paper. The difference in these two points with and without the corset will demonstrate the effect of the corset on posture.

Essentials of a Well-fitting Corset.—Following are the essential features of a well-fitting corset:

1. Loose at the top.
2. Waist not reduced more than one or two inches.
3. Laced snug at the hips.
4. Straight front with little or no incurve at the waist.
5. Long below and low at top.
6. Separate lace for lower six or eight holes.
7. Support large breasts independently from the shoulders.
8. When the abdomen is large or the abdominal walls relaxed a front lace corset should be adjusted in the recumbent position or the abdomen may be raised by slipping the hand inside the corset before tightening while in the erect position.

CHAPTER XIII

PREPARATION OF PATIENT FOR OPERATION

Examinations for Contra-indications
Local Treatments Preparatory to Operation
Preparation of the Field of Operation
Choice of Local or General Anesthesia
Local Anesthesia
General Anesthesia
Spinal Anesthesia
Combined Gynecological Operations
Diet

The time consumed in the preparation of a patient for a major operation depends upon two factors: (1) The urgency of the indication for the operation; (2) the condition of the patient in reference to the general nutrition, blood, kidneys, and respiratory tract.

Examination for Contra-indications.—When there is no contra-indication to an immediate operation from the causes referred to below, twenty-four hours will be sufficient time in which to prepare a patient for operation; but conditions may be such as to necessitate a delay of days, weeks, and possibly months before an operation can be performed without unwarranted risk to life. The author is persuaded that lives are not infrequently lost by failure to look to the details of preparations for operation. The following are the main considerations in the preparatory management of operable cases:

Blood.—The blood should be examined in all cases before proceeding with an operation, and no major operation of convenience should be undertaken with the hemoglobin lower than 50 per cent. and the number of red cells less than 2,500,000. If the patient is losing blood more or less continuously, as from a uterine fibroid or carcinoma, a preliminary curettage or vaginal pack may be resorted to for the purpose of checking the hemorrhage, while rest, forced feeding, and tonics are administered. By such a process the author has seen the blood restored at the rate of 10 per cent. a week.

Heart.—When the heart is irregular and weak in its action, rest in bed, together with small doses of strychnine, should be enjoined until the heart has regained its strength and regularity of action. Rest in bed, a light, nutritious diet, and carefully regulated doses of strychnine and digitalis may in a few days or weeks so restore the action of an incompetent heart as to render it capable of withstanding the strain of a prolonged operation.

Irritation of the Air Passages.—When there is acute irritation of the air passages operation should be delayed, if possible, until all signs of irritation have subsided. Failure to observe this precaution may precipitate a bronchopneumonia.

General Lowered Vitality.—General lowered vitality is a factor which the surgeon would do well to consider carefully before operating. Patients with low resistance, as manifested in poor nutrition, a low blood-count, and low blood-pressure, should be given a course of rest, feeding, and tonics before subjecting them to an operation of convenience.

Faulty Secretions.—Faulty secretions may constitute a justifiable contra-indication to operations of convenience. If the urine secreted is below the normal amount, or if it contains morbid elements, such as blood, albumin, and casts, operation should await the correction of this condition, unless it be an emergency that will brook no delay.

Local Treatments Preparatory to Operation.—The haste which characterizes modern life is exemplified in surgery. This criticism applies, in large part, to the management of pelvic inflammations in the acute and subacute stages. Too great haste in surgical intervention, under such conditions, may result in unnecessary sacrifice of organs which, by tentative mangement, might have been restored to functional if not organic health. More than this, infections which are localized may be extended, and with disastrous results, if attacked early in their course.

In such cases non-interference is the watchword; rest, hot douches, and glycerin—ichthyol tampons are means which conserve the tissues and prepare them for possible operations in which the hazards will be greatly diminished. This is not true of the chronic forms of pelvic inflammation wherever located. Here local preparatory treatment is of no value.

As will appear later, many cases which are included in the domain of general surgery can be relieved by local and general treatment, but it takes a clear understanding of the diagnosis and the relative values of conservative and radical measures to permit of a ready decision as to the proper procedure to be adopted.

In the days of Emmet, at a time when surgical cleanliness could not be relied upon, operations for lacerated cervix and perineum, displaced uteri and abdominal tumors were not undertaken without local preparatory treatment. A clearer understanding of pathology and a greater confidence in immediate surgical preparation have largely done away with such preparatory measures. This does not apply to fistulæ which may demand careful and long preparation before operation.

When there is nothing in the condition of the patient to contra-indicate an immediate operation, the time for the preliminary preparations need not exceed twenty-four hours.

Only when confronted with an emergency should the preliminary preparation of the field of operation be omitted. A double preparation of the field of operation should be the rule several hours before the operation; the second immediately preceding the operation, either before or after anesthesia. The author's preference is to make the

second preparation of the field of operation after the anesthesia is well started, unless there is special reason for shortening the time of anesthesia, the patient nervous, or the scrubbing causes too great discomfort. It is expected that the patient will reach the stage of relaxation in the anesthesia by the time the preparatory measures are completed.

Diet.—Twenty-four hours or more before operation the diet should be light and nutritious and the bowels thoroughly evacuated.

Cartharsis.—The author has never deemed it necessary to deviate from the established rule practised years ago, that of giving 1 or 2 grains of calomel and sodium bicarbonate, followed in six to eight hours with ½ ounce of Epsom salt; again in six hours with a high colonic flushing, given in the knee-chest position, and finally a low colonic flushing given three hours before the operation. Other cathartics may be given, with perhaps equally good results. By thoroughly cleansing the bowel there will be less distress from gas pains subsequent to the operation, and in vaginal operations there is not the likelihood of soiling the field of operation.

Stimulation.—As a rule no stimulation should be given before the operation. It is found that the patient suffering from depression during the operation, reacts more promptly to stimulation when she has not been stimulated prior to the operation. A good precautionary measure against postoperative vomiting is to encourage the drinking of large quantities of water up to two hours before the anesthetic.

Combined Abdominal and Vaginal Preparation.—Whether a vaginal or abdominal operation is proposed, it is wise to take the precaution to prepare both the vagina and abdomen, because of the uncertainty which attends such a large proportion of gynecological operations. Before beginning an operation it is not possible to say with absolute certainty that it will not be necessary to open into the vagina for the purpose of drainage or the removal of the uterus. In like manner a proposed vaginal operation may lead to the opening of the abdomen through the finding of an unsuspected condition in the pelvis or the accidental perforation of the uterus.

Preliminary Examination.—When the patient is relaxed under anesthesia, and before the operation is begun, it should be the invariable rule to make a bimanual examination, for unsuspected conditions may in this way be revealed. Such preliminary examinations prior to operation may alter the decision of the operator and cause him to do a vaginal rather than an abdominal operation, and *vice versa;* hence the advisability of preparing both the vagina and abdomen in all proposed operations on pelvic lesions. Failure to do so will occasionally lead to great embarrassment to the operator and add unwarranted risks to the patient.

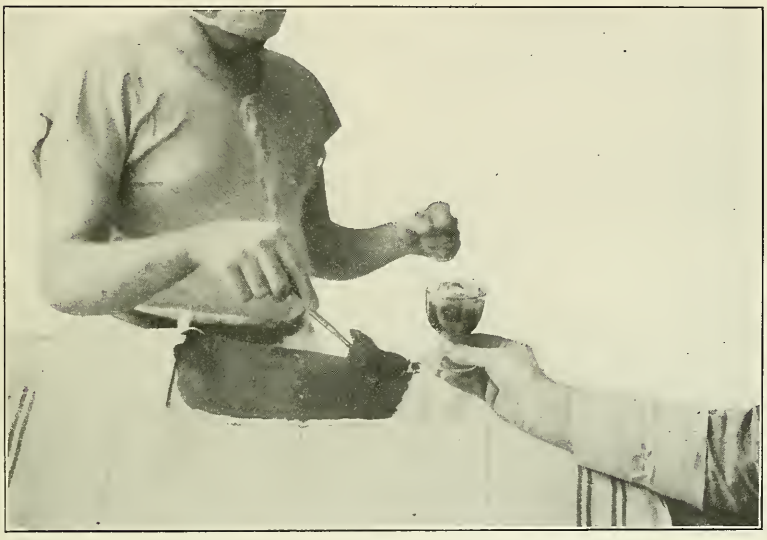
Preparation of the Field of Operation.—A great variety of methods is employed in the preparation of the field for operation. All have merit and no one excels over all others. The following is the method which the author employed for many years:

Preparation of Abdomen.

A. Preliminary (twelve to twenty-four hours before operation).

1. Scrub with green soap and sterile water.
2. Shave the entire abdomen, groin, vulva, and chest to the level of the breasts.
3. Scrub ten minutes with green soap, sterile water, and sterile gauze.
4. Wash with sterile water.
5. Wash with alcohol, 95 per cent.
6. Wash with ether.
7. Apply creolin solution, 1 per cent.
8. Apply dressing of dry sterile gauze and binder.

FIG. 124



Painting the abdomen with iodine and alcohol, equal parts.

B. Immediate preparation before or after anesthesia.

1. Scrub with alcohol.
2. Apply solution of creolin eight parts and glycerin two parts, rubbing well into the skin for three minutes.
3. Remove creolin solution with sterile gauze and wash with alcohol.
4. Cover patient with sterile sheets and towels.

IODINE STERILIZATION.—In the past two years the author has used the iodine preparation on the abdomen, with good result, and has practically discarded the above method because the iodine sterilization is equally trustworthy and is far more convenient. The method consists in:

1. Dry shave.
2. Scrub with alcohol or benzine.
3. Paint field of operation with 3 per cent. tincture of iodine.
4. Wait ten minutes.

5. Paint again with 3 per cent. tincture of iodine. When the patient can be prepared on the previous day the author carries out the usual preparation of scrubbing, shaving, washing with alcohol, and applying a sterile pad and binder. He is not convinced, however, that such precautions add security to the patient.

Preparation of Vulva and Vagina.

A. Preliminary.

1. Scrub with green soap and sterile water.
2. Shave external genitals and inner aspect of thighs.
3. Wash with sterile water.
4. Cleanse vagina with green soap and sterile water, using only the fingers rather than gauze in scrubbing, for fear of removing the vaginal epithelium.
5. Irrigate vagina with sterile water.
6. Apply 1 per cent. solution of creolin to vagina, scrubbing well with the fingers.
7. Scrub external genitals with creolin solution, 1 per cent.
8. Apply perineal dressings preparatory to operation.

Iodine Sterilization.—It will be found perfectly safe to swab the vagina and external genitals with 3 per cent. tincture of iodine.

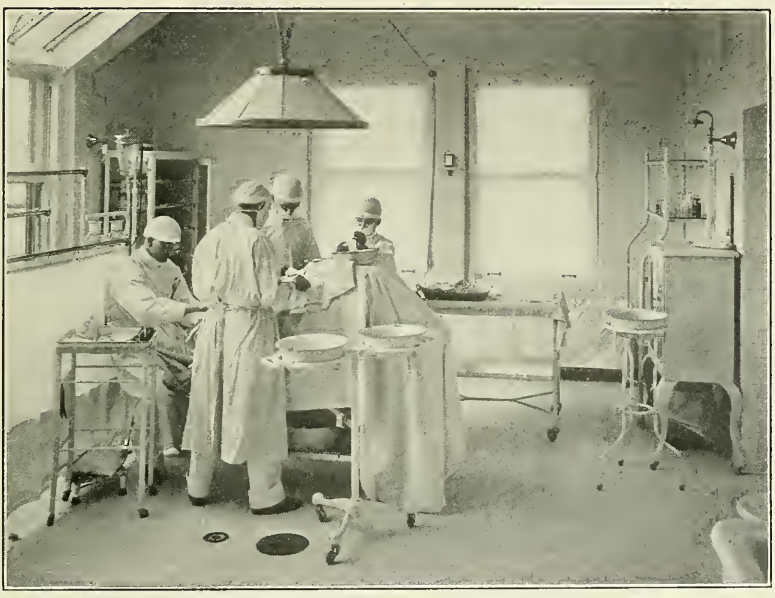
Choice of Local or General Anesthesia.—When all things are made ready for an operation the choice of the anesthetic devolves upon the operator. The greater the experience of the operator the more does the importance of this task appeal to him, for with experience comes an appreciation of the dangers involved in individual cases. The surgeon of experience knows that no anesthetic is without some element of danger, that every case is a law unto itself and demands special consideration in the choice of anesthetic. There are cases in which the operation is so slight that neither general nor local anesthesia is required. The slight discomfort in the procedure would not justify the risk, however slight, of a general or local anesthetic. There are other cases in which there is profound depression from sepsis or hemorrhage, or the heart, lungs, or kidneys are in such a condition as to contraindicate the use of any general anesthetic. Such cases compel the operator to resort to local anesthesia or to abandon all anesthetics.

All sorts of operations have been performed with endermic injections of cocaine or Schleich's solution without the degree of suffering that would be expected. Vaginal and abdominal operations are performed under local anesthesia, with surprisingly little pain, provided no traction is made upon peritoneal ligaments and mesentery. The author has performed as capital operations, with the aid of local anesthesia alone as with general anesthesia, and the results have been equally satisfactory. In all these cases the condition of the patient presented positive contra-indications to the administration of a general anesthetic and yet would brook no delay.

Such, for example, were cases of ruptured tubal pregnancy, with the escape of a large quantity of blood, and, again, of profound sepsis associated with great depression.

It is the rule of the author, when operating under local anesthesia in major cases, to have an assistant drop upon an Esmarch inhaler a mixture of alcohol and wintergreen. This the patient believes to be an anesthetic. By this ruse, and with words of assurance from the operator and anesthetizer, she is carried through the operation with much less suffering than would be expected. While a general anesthetic facilitates the operation, and without it the niceties of technic cannot always be accomplished, it must be borne in mind that the purpose of the operation is to restore health and save life, and to this end the first consideration is that of the safety of the patient. Unquestionably general anesthesia is frequently resorted to when a local anesthetic or no anesthetic whatsoever should be given.

FIG. 125



Operating room in hospital. Patient in Trendelenburg position preparatory to making an abdominal incision.

Local Anesthesia.—When the field of operation is superficial and limited to a small area a local anesthetic will usually suffice. When a general anesthetic is contraindicated in major vaginal or abdominal operations the initial incision through the vaginal or abdominal wall may be made painless by a local anesthetic. The further steps of the operation can usually be taken without creating great suffering on the part of the patient.

Cold.—The application of cold to the surface in the form of a spray of ethyl chloride benumbs the surface by paralyzing the sensory nerves. The spray is applied for about five minutes or until a crust of ice forms

upon the surface at the point of incision. Bengue's ethyl chloride is supplied in vials containing 30 grains. These vials are provided with brass tips containing a capillary opening and screw-top. Anesthesia may be almost as effectively accomplished by applying a bag filled with cracked ice and salt for five or ten minutes.

Cocaine.—The hydrochlorate of cocaine may be applied to the surface of the mucous membranes or injected under the skin. An application to the surface of the vaginal mucosa will not anesthetize the tissues; here an injection is required as in skin surfaces. Injections of cocaine into the urethra and rectum are dangerous. Under a 2 per cent. cocaine anesthesia, vulvar and vaginal cysts may be removed, the urethra may be dilated with little pain, and polyps may be removed. In exceptional cases, perineorrhaphy and colporrhaphy may be performed; but, as a rule, little can be accomplished in the relief from pain because the anesthetic effect of the cocaine does not persist throughout the operation.

Schleich's Solution.—This solution consists of morphine, cocaine, and normal salt solution. It has been found less dangerous and more efficient than cocaine as a local anesthetic. By the hypodermic injection of Schleich's solution the nerve terminals are paralyzed through pressure. The needle is thrust under the skin in a nearly perpendicular direction, and the fluid is forcibly injected until the skin is elevated and blanched. Successive injections are made at the periphery of the swelling, along the line of incision. No time should be lost in the making of the incision after the injections. It is probable that the injection of normal salt solution will be found equally as efficacious.

General Anesthesia.—The choice of anesthetic will depend upon the condition of the patient, with particular reference to the respiratory tract, heart, kidneys, blood, and the general resistance of the individual. In the United States ether is generally regarded as the safest of the general anesthetics when not contraindicated by irritation of the respiratory tract.

Anesthetizer.—There can be no more fatal error than to fail to appreciate the responsibilities of the anesthetizer. To relegate the administration of the anesthetic to an inexperienced assistant is an unpardonable act. The choice of the anesthetizer is only secondary to that of the operator, and equal experience and skill should be demanded of both. Equally to be condemned is an anesthetizer who permits himself to be absorbed in the operative procedure and fails to be attentive to his duties. An inexperienced or careless anesthetizer either harasses the operator by failing to keep the patient relaxed or endangers the life of the patient by giving an unwarranted amount of anesthetic. When a competent anesthetizer is employed the decision as to the time and amount of stimulation should rest with him. The anesthetizer should always be provided with a mouth gag, tongue retractor, bits of gauze held by forceps with which to swab the mucus from the throat, and a watch to note the pulse rate. Failure to observe these precautions have not infrequently led to fatal error.

Signs of Complete Anesthesia:

1. Complete muscular relaxation.
2. Deep, slow and regular breathing.
3. Contracted pupils.
4. Loss of pupil reflex.

Signs of Danger.—When the anesthetic has been pushed too far the first approach of danger is usually observed in the grayish pallor of the face. The pulse becomes feeble and rapid, possibly irregular, and the respirations shallow and slow until both become imperceptible. The blood from the wound becomes dark and may cease to flow. The pupils are dilated and fixed.

Resuscitation of the Patient.—Prompt and masterly action is demanded of the anesthetist when signs of danger arise. A feeble pulse, cessation of the respirations, dilated pupil, and pallor point to impending death, and no time should be lost in putting into force all known methods of restoration. The foot of the table should be raised to an angle of 40 to 50 degrees; the operation must be suspended; all open vessels secured with hemostatic forceps; the wound covered with warm sponges; the jaws held forward and upward and the tongue retracted by means of especially constructed forceps which should always be at hand. If necessary to resort to artificial respiration the Sylvester method should be employed. The head is made to fall slightly backward by elevating the thorax with a small pillow. The surgeon standing at the head of the patient grasps both wrists and elevates both arms above the patient's head, drawing them upward and outward so as to describe a circle. By so doing the pectoral muscles expand the chest. The arms are then lowered and are made to compress the chest firmly, thereby forcing the air out of the lungs. These movements are repeated at intervals of three to five seconds until respiratory movements are reëstablished.

Gas Anesthesia.—In the author's experience he has found the greatest satisfaction in the employment of gas for operations of short duration and as a preliminary to ether anesthesia. He has never attempted the prolonged administration of gas, but as a preliminary measure to ether anesthesia, time and ether are saved and the patient is spared the distressing experiences of struggling under ether during the preliminary stages of excitement.

Ether Anesthesia.—Care should be exercised in the selection of a pure brand of sulphuric ether. The only absolute contraindication to the use of ether is laryngeal and bronchial catarrh. Nephritis has been generally regarded as a contraindication, but there is probably no rational basis for this belief. Many of the inhalers on the market are cumbersome, and only serve to burden and confuse the anesthetizer. As an improvised inhaler a cone made of stiff paper and towel still remains in general favor. In the author's judgment the safest procedure is the drop method, in which the ether is dropped from a can or bottle upon an Esmarch inhaler in the same manner as chloroform is administered, but in larger quantities.

It is an error to force the ether upon the patient; it should be given slowly and continuously. When the patient gags and vomits the mask should not be removed, but the ether should be continued until the spasmodic efforts of the patient are under control. Ripened judgment is required after general relaxation is obtained and constant vigilance is exacted of the anesthetizer in order that neither too little nor too much ether be given.

Chloroform.—While chloroform is the anesthetic of choice in Europe, and indeed in the Southern States, there is a general prejudice against its use in the Northern States. While the patient is put to sleep in less time, with less discomfort and the disagreeable after-effects are minimized as compared with ether, the hazards to life are proportionately great. Adulteration of the product increases the risks, and hence the greatest care should be exercised in the selection of the brand. The one absolute contraindication to the use of chloroform is an incompetent heart. Valvular lesions of the heart in the presence of good compensation offer no contraindication. According to Hare, chloroform is more irritating to the kidneys than ether. Whenever it is essential that struggling shall be avoided, chloroform is preferred. In such cases it is well to precede the administration of chloroform by the hypodermic injection of $\frac{1}{4}$ grain of morphine, given a half-hour in advance.

Hare affirms that death from chloroform is more often the result of respiratory than of cardiac paralysis. As a rule the pulse fails earlier than the respiration. The administration of chloroform should never be wholly intrusted to an inexperienced assistant. Unlike ether anesthesia the mask should be removed when the patient vomits or the throat fills with mucus, and should not be replaced until the struggling ceases.

Spinal Anesthesia.—For a time much was expected of the injection of cocaine into the subdural space of the cord for anesthesia of the abdomen and lower extremities, but it may be safely affirmed that there is no place for the procedure in view of its many dangers.

Combined Gynecological Operations.—The term combined gynecological operations implies the performance of two or more gynecological operations under the same anesthesia.

Advantages of Combined Operations.—Two or more lesions commonly exist in the pelvis and together contribute to the symptom-complex. It is self-evident that failure to correct all of the lesions will result in failure in obtaining complete relief. For example, a displaced uterus should not be restored to its normal position without correcting any existing defect in the pelvic floor and vaginal walls. Furthermore, lesions resident in the appendages and appendix should receive due consideration. Again, when the uterus and its appendages are infected it will serve no good purpose merely to curet the uterus; the lesions resident in the upper genital tract should, at the same time, be disposed of.

Pain, hemorrhage, leucorrhea, and sterility are the complaints common to gynecological cases. One or all of these complaints may be due to a single lesion, but not uncommonly there is a combination of lesions, each contributing its share to the symptom-complex, hence

the importance of looking beyond a single lesion for the cause of a symptom or group of symptoms. When two or more contributing factors are found to account for the complaints, all should be removed under a single anesthetic if the physical resistance of the patient and the time limit of the operation will permit.

In the course of an operation minor lesions are often disposed of which in themselves might not justify operative intervention, *i. e.*, cystic ovaries, small superitoneal fibroids, and relaxed uterine supports without displacement of the uterus.

When the low vitality of the patient will not permit an extended operation or the combined work required is too great for a single anesthetic it is advisable to perform the operation in two or more steps, but, as a rule, all work should be completed before the patient leaves the hospital.

Diet.—It is important for the surgeon to be well informed in dietetics, but the scope of this work does not permit an extended discussion of the subject. In selecting a suitable diet for a patient the first consideration is that of nourishment and the second is that of palatability. To meet the varied requirements of individuals it is essential to have a thorough knowledge of dietetics.

Liquid Diet.—It is the author's custom to prescribe nothing but liquid diet for the first twenty-four hours following a major operation. As a rule, milk should be excluded from the diet list until the functions of the digestive tract are well established, and this generally requires several days following the operation. In the first twenty-four to forty-eight hours the diet should consist of broths, gruels, bouillon, albumen water, and beef juice. These may be given at four- to eight-hour intervals, and in small quantities. If milk is given at this early date it is well to add lime water, Vichy, or Seltzer. To add to the digestibility of milk the contents of one of Fairchild's peptonizing tubes may be dissolved in four ounces of water and one pint of milk. This may be given either hot or cold. Milk may be albumenized by adding the white of an egg to two ounces of milk, this to be stirred gently with a spoon, care being taken to avoid coagulation of the albumen. Again, the milk may be rendered more digestible by pasteurizing at a temperature of 160° F. for one-half hour. Koumiss is digestible and palatable to many patients. A good substitute for koumiss is buttermilk, served either hot or cold. Egg-nog may be served between meals when forced feeding is desired. Whisky, sherry, or brandy may be added in small quantities.

Soft Diet.—In all but exceptional cases a soft diet may be given the second or third day following operation. In addition to the foodstuffs mentioned under liquid diet, there are added such articles as soft-boiled, poached, or scrambled eggs, baked or creamed potatoes, toast (dry, milk, or cream), cereals (oatmeal, cream of wheat, cracked wheat), fruit (stewed prunes, baked apple, oranges), egg custards, corn-starch pudding, and rice pudding.

It is well to withhold all meats, vegetables, and fruits not included in this list until the patient is well on the way to recovery.

CHAPTER XIV

PRINCIPLES OF ASEPSIS IN GYNECOLOGY

Sterilization of Field of Operation
Disinfection of Hands and Forearms
Preparation of Surgical Utensils
Preparation of Gauze and Sutures
Preparation of Instruments
Sterilized Water
Preparation of Operating Room
Preparation for Operation in Private House
Operating Bag

Until recent years the principles of asepsis in surgery were little known and imperfectly practised. The field of operation, the hands of the assistants and operators, the materials used in the operation—including instruments, suture material, gowns, sponges, dressings, and solutions—were not perfectly sterile.

The rendering of all these things free of pathogenic microörganisms constitutes aseptic surgery. The procedure is of such vital importance that a detailed recital of the methods of sterilization might be of interest, but the details are so varied that the author must confine himself to a description of those methods which he himself employs. In many instances they are no better than others elsewhere in vogue, but space will not permit of a consideration of all approved methods.

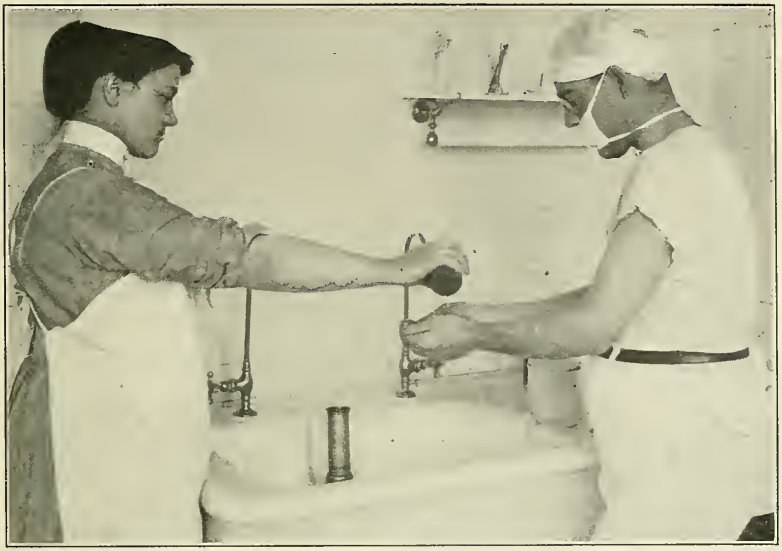
Sterilization of the Field of Operation.—See page 244.

Disinfection of the Hands and Forearms.—The surgeon and his assistant should guard against the contamination of their hands with septic material. They should, therefore, not engage in postmortem examinations or in the treatment of acute infectious diseases. When operating on the cadaver or on septic cases the hands and arms should be protected by long rubber gloves. Failure to regard such precautions may be the means of conveying infection to the field of operation.

In disinfecting the hands and forearms greater importance should be attached to mechanical than to chemical disinfection. Undue reliance is often placed upon chemical disinfection. No amount of antiseptics can atone for laxity in the use of the scrub brush. A stiff sterile nail brush should be chosen, and should be of sufficient size to permit vigorous usage. The author is in the habit of scrubbing his hands under running water from the tap. The temperature of the water should be as hot as can be borne comfortably by the hands. Green soap is preferred to all others. The arms should be scrubbed to the elbows, and special care should be directed to cleaning the inner surfaces of the fingers and nails. An orange stick and peroxide of hydrogen are best suited for cleaning the finger nails. Ten minutes should be occupied in scrubbing. The arms and hands are then thoroughly rinsed in sterile water and dried with a sterile towel.

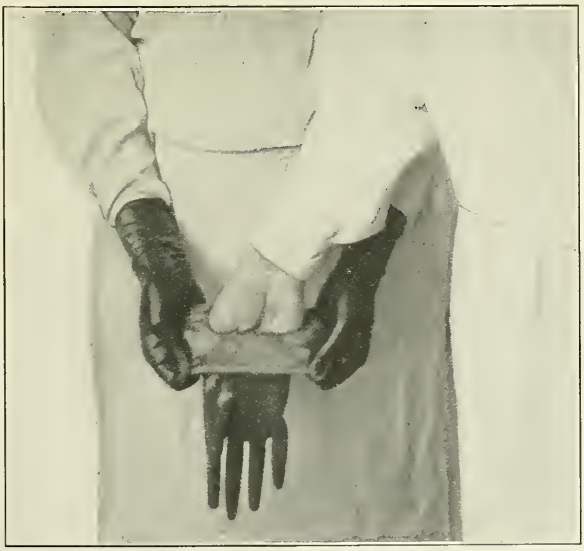
An assistant pours into the palms of the hands about two drams of a solution composed of eight parts of creolin and two of glycerin. This

Fig. 126



Scrubbing of hands. The nurse pours liquid green soap on the hands of the operator.

Fig. 127



Method of putting on dry sterile gloves. Gloves and hands are powdered with sterile talcum. The assistant holds the sleeve of the glove well apart while the operator inserts his hands. In this manner the hand does not touch the outside of the glove.

solution is rubbed into the hands and arms for five minutes. The hands and arms are then washed in a 1 per cent. creolin solution, next in sterile water, and finally in alcohol. A long sleeve gown is then put on and the hands covered with sterile rubber gloves. A mouth-piece of several layers of sterile gauze should cover the mouth and nose. One objection to the creolin and glycerin solution is that it smarts the arms. This can be largely overcome by thoroughly drying the hands and forearms before applying the solution.

Fig. 128

Operator prepared for operation.

Preparation of Surgical Utensils.—Brushes.—Small, flabby nail brushes should never be employed; they should be made of stiff bristles, and when the bristles have lost their stiffness the brushes are to be discarded. They should be large enough to afford a good grasp, but not so large as to be unwieldly. Sterilization of the brushes should be by boiling, preferably in water containing soda bicarbonate. Before taking up a sterile brush to scrub the hands, they should be first washed with soap and water, otherwise the brush will become unnecessarily contaminated. After vigorous scrubbing with the brush the author completes the scrubbing process by using sterile gauze sponges, green soap, and hot sterile water. The sponge has the advantage of not roughening the hands.

Basins.—Glass or porcelain-lined basins for the hand solution, instruments, sponges, and dressings are preferred, though agate-ware is acceptable. These are best sterilized by putting a number of such clean basins in a pillow-slip and placing them in a steam sterilizer. When the sterilizer is not large enough to accommodate them they may be boiled in a wash-boiler. For hurried sterilization of pans and glass vessels, they may be rinsed with pure carbolic acid, then with alcohol, and finally with sterile water. In a well-equipped hospital a utensil sterilizer is of the greatest convenience and utility.

Rubber Drainage Pads.—A Kelly drainage pad is indispensable for carrying away solutions while preparing a patient for operations and in irrigating during operation. The Kelly pad is cleansed by scrubbing with soap and water, followed by a thorough scrubbing with a strong solution of lysol or creolin. A sterile towel is then placed over the pad.

Towels, Bandages, Gauze Dressings, Sponges, and Cotton.—These are subjected to fractional sterilization in a steam sterilizer, first for one hour, then for half an hour on two successive days. If not used for three or more days after sterilizing it is well to sterilize them again for half an hour on the day of the operation. All towels, sponges, and dressings should be wrapped in small packages and counted and labelled before being placed in the sterilizer.

Preparation of Gauze and Sutures.—**Iodoform Gauze.**—Sterile gauze is cut in desired lengths and widths. These strips are then saturated in the following solution: Warm Castile soapsuds, 6 ounces; powdered iodoform, 1½ ounces. After thoroughly mixing the solution in a sterile basin the gauze strips are saturated by rubbing the solution into the gauze. The strips are then wrapped in small packages, labelled, and placed in a sterilizer and sterilized on three successive days. In preparing the gauze the surgical nurse should wear sterile gloves and gown.

Silk and Linen.—Surgical silk and linen are best sterilized by steam. The silk is rolled upon glass bobbins, several of which are placed in an ignition tube with a cotton stopper. The filled tube is then placed in a steam sterilizer, along with the towels, sheets, and sponges. After sterilization the cotton stopper is pushed firmly into the tube and placed in a glass jar to await its use. Frequent sterilization weakens silk and linen, so that only a small amount should be placed on each bobbin. The most serviceable sizes are Nos. 2, 3, and 4. Twisted silk is preferred to the braided. The author has found little need for silk and linen in gynecological practice. Practically the only places where they are used is in closing the abdominal incision where the abdominal wall is very heavy or for the repair of a postoperative hernia. In such cases two to four stay sutures of No. 3 twisted silk or heavy linen may be passed through all layers except the peritoneum. The external sutures of a perineorrhaphy may also be of No. 2 or 3 twisted silk, the advantage over silkworm gut being greater comfort for the patient.

Catgut.—For all private work and for a limited amount of hospital work the surgeon is scarcely justified in preparing his own catgut. It

is safer to rely upon the established firms, such as Lea, Van Horn, Walters, and Lukins.

When an operator is using a large quantity of catgut he may, for purposes of economy, prepare his own catgut. The methods of preparing catgut are too numerous to mention. The author's preference is for the Bartlett catgut, which is prepared as follows:

1. "The strands are cut into little coils about as large as a silver quarter of a dollar. These coils, in any desired number, are then strung like beads on to a thread, so that the whole quantity can be conveniently handled by simply grasping the thread.

2. "The string of the catgut coils is dried for one hour at a temperature of 180° F., and then for a second hour at 220° F., the change of temperature being gradually accomplished.

3. "The catgut is placed in liquid albolene, where it is allowed to remain until perfectly 'clear,' in the sense that the term is used in the preparation of histological specimens. This is usually accomplished in a few hours, though it has been my custom to allow the catgut to remain in the oil overnight.

4. "The vessel containing the oil is placed upon a sand bath overnight and the temperature raised during one hour to 320° F., which temperature is maintained for a second hour.

5. "By seizing the thread with a sterile forceps the catgut is lifted out of the oil and placed in a mixture of iodine crystals, 1 part, and Columbian spirit (deodorized methyl alcohol), 100 parts. In this fluid it is stored permanently, and is ready for use in twenty-four hours."

The advantages of Bartlett catgut are its strength, elasticity, and antiseptic qualities.

Silkworm Gut.—The preparation of silkworm gut is like that of silk. For hurried preparation it may be boiled or carbolized.

Preparation of Instruments.—Simplicity in construction is an essential quality for surgical instruments. All irregularities upon instruments add to the difficulties in cleansing, and should be dispensed with as far as possible.

After operating, all instruments should be scrubbed in soap and water, rinsed in sterile hot water, and thoroughly dried. After use in septic cases instruments should be boiled before being dried. No rusty instruments should be used because of the difficulty in sterilizing them.

In selecting instruments for operation the operator should bear in mind the possibility of having to meet with the unexpected, and therefore the supply of instruments must be liberal. As a safeguard it is always well to sterilize all instruments needed in abdominal and vaginal operations irrespective of the probable demands. In order that no instruments be overlooked the operator should select his own instruments and should lay them in the tray in the order of their expected use. For example, he first selects the knives, then the hemostats of all sizes, next the tissue forceps, then the retractors, scissors, pedicle needles, needle holders, tenacula, needles, etc., until the list

is complete. There should always be at least two knives, two scissosr, and two needle-holders, in case one should drop to the floor or in any way become unserviceable.

The instruments are boiled in 1 per cent. bicarbonate of soda solution for ten minutes; this solution should completely cover the instruments. In order to preserve the cutting edge, all scissors and knives should be sterilized by dipping first in pure carbolic acid, then in alcohol, and finally in sterile water. The sterilized instruments are placed in glass trays partly filled with sterile water, or may be laid upon a sterile table and covered with a sterile sheet or towels.

Sterilized Water.—All water used in operations should be first filtered and then boiled for a half hour. An abundant supply of sterilized water, both hot and cold, should always be at hand.

Preparation of Operating Room.—In the construction of an operating room, utility rather than useless ornamentations should be the aim. Ornamentations only add to the expense and to the labor in keeping the room in order.

The essential factors in the construction of a modern operating room are good light, good ventilation, sufficient space, and convenience. The best light comes either through the north side or through a skylight sloping to the north.

Over the operating table should be an electric bracket, with a group of four or more lights, and to this bracket is attached a portable light with a reflector. Gas should be provided as a substitute in case the electricity is out of order. The ventilation should be adequate but of the simplest construction. No currents of air should be permitted to come in contact with the patient. Whatever the material used for walls and floor it must be smooth and of hard finish. While marble is durable and ornamental, it cannot be claimed that it is more serviceable than enamelling. The floors may be of tile, mosaic, or cement. All angles should be rounded to facilitate cleaning. The dimensions of the room should be not less than 12 x 14, and the ceiling not less than ten feet high.

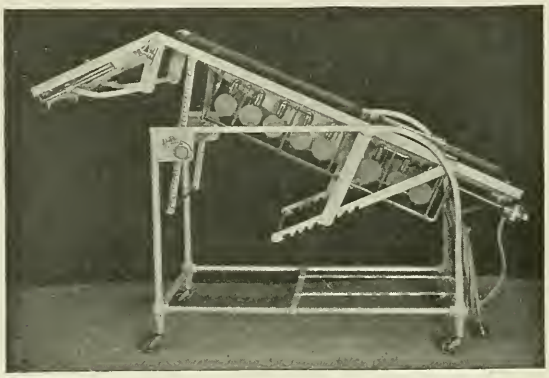
A well-appointed operating room suite will consist of an operating room, sterilizing room, surgeons' dressing room, with shower bath, appliance room, anesthetic room, and recovery rooms. The equipment of the operating room should be substantial and simple. The stationary basins for washing the hands should be three or four in number, and should be provided with hot and cold water controlled by a pedal attachment.

No sterilizers, water-boilers, receptacles for dressings and the like should be in the operating room.

Warming the Operating Table.—As a preventive measure to shock in cold weather the operating table may be warmed by a series of electric lights fitted to a frame under the table. Robb has devised a series of electric lamps held in an upright position by attachments to two hollow, movable metal tubes, which are applied to the under surface of the table. There are two rows of thirty-two candle-power

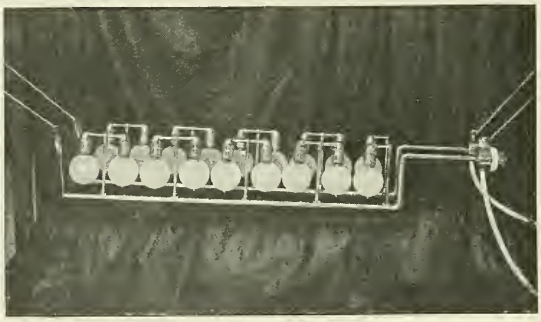
lamps, each of nine lamps. The amount of heat is controlled by a series of switches, making it possible to turn on two lamps at a time until the desired amount of heat is supplied. The apparatus is detachable and can be used wherever there are electric attachments.

Fig. 129



Showing lamps with table in Trendelenburg position. (Robb.)

Fig. 130



Showing lamp detached from operating table. (Robb.)

Preparation for Operation in a Private House.—While it is possible to prepare and equip an operating room in a good private house so that the principles of aseptic surgery can be carried out, it is always at the expenditure of much time and labor.

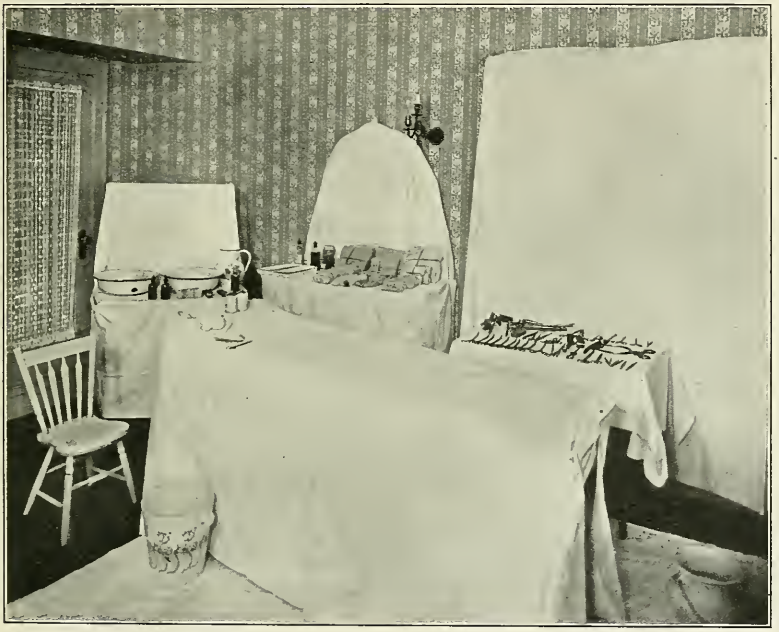
The surgeon naturally feels that it is his assistants who fail to adapt themselves to the strange and more or less improvised surroundings, but, as a matter of fact, he himself is not so much the master of the situation as when in his own operating room and hospital.

Frequently the needed equipment is not at hand, the light may be faulty, the temperature and ventilation of the room not properly regulated; these and many other things cause him annoyance. The

only satisfactory way is for the operator to take with him his own trained assistants.

Preparation of the Room for Operation in the Home.—In preparing a room for operation, light, space, and cleanliness are of the first consideration. All unnecessary articles are to be removed. The floor and all wood-work in the room should be scrubbed and the walls and ceiling wiped. The mattress should be aired and covered with fresh linen, underneath which should be placed a rubber sheet. Only a wet cloth should be used in cleaning the room on the morning of the operation, and every precaution should be taken to prevent dust from rising in the air. Clean sheets may be hung over the walls.

Fig. 131



Room prepared for abdominal operation in private house.

The following articles should be provided for the room: a common kitchen table, four wooden chairs, a dishpan, a foot bathtub, two water buckets, two small tables, one rubber sheet two yards long by one yard wide, a bed-pan, three earthen pitchers, a new wash-boiler, several quart bottles suitable for hot water, one dozen clean towels and two clean sheets, and four wash-basins, preferably of porcelain-lined granite-ware.

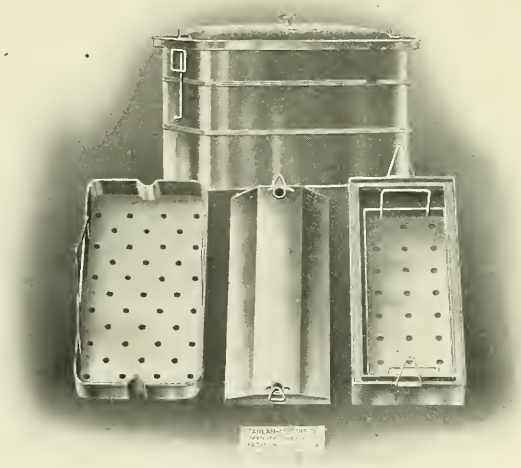
A trained assistant should be sent the day before the operation to make all needed preparations. When the time is short the attendant should be directed to scrub a new wash-boiler with Sapolio, to rinse it out thoroughly, and then to fill it two-thirds full of water and boil for

an hour. The water should be boiled two hours before the operation, and without removing the lid it should be allowed to cool and await the coming of the operator. It is exasperating to be compelled to wait for water to cool.

Upon arriving at the house the surgeon should inspect everything to satisfy himself that all is as it should be. In emergency cases, when there has not been time to take up the carpets the day before the operation, they should not be removed for fear of raising the dust; instead, damp sheets may be placed over the floor. With a portable operating table, brought by the surgeon, it is possible to perform any operation without serious embarrassments.

The operator must exercise great vigilance with his assistants who may not be able to accommodate themselves perfectly to strange environments and thereby be led into grave errors in technic.

FIG. 132



Portable combination sterilizer for instruments and dressings.

The greatest objection that can be offered to operating in houses is the necessity of leaving the after-care of the patient to other and often inexperienced hands. This is most unfortunate, and in the author's judgment a surgeon is justified in declining to accept the responsibility of such a case unless it be an emergency. He should make sure that the case will receive skilled after-treatment or decline to operate, unless, as has been said, the case is an emergency and cannot be taken to a hospital.

Operating Bag.—The surgeon should always have his operating bag in readiness. This bag should contain all needed instruments, freshly sterilized sheets, towels, pads, sponges, and dressings. Upon arriving

at the house all that is needed is the preparation of the patient, a suitable table, an abundance of sterile water, and three or four sterile pans. These things should be attended to by the nurse in charge before the arrival of the surgeon, so that there need be little delay.

Contents of a Complete Operating Bag for Abdominal Operations.—

Instruments and Accessories:

Green soap in compressible tube or glass jar.
Four nail brushes.
Creolin-glycerin solution, 8 to 2 (four ounces).
Bichloride of mercury tablets.
Alcohol (eight ounces).
Razor.
Ether (one pound).
Ether mask.
Hypodermic syringe and strychnine, 1 to 40 tablets.
Rubber irrigating bag with glass nozzle.
Four rubber sheets, one yard square.
Three long sleeve aprons.
Safety pins (one dozen).
Laparotomy pads (three sizes).
Sponges.
Iodoform gauze (one large and several small rolls).
Dressings of sterile gauze.
Muslin abdominal binder.

Surgical Instruments, Sutures, and Ligatures:

Two knives.
Two pairs of scissors.
One long and two short tissue forceps.
One Simpson abdominal retractor.
Two Simon's specula.
One dozen six-inch hemostats.
Six large hemostat forceps.
Two needle holders.
One dozen assorted needles.
Two pedicle needle holders.
Silkworm gut.
Silk, sizes 2, 3, and 4.
Catgut, sizes 1, 2, 3, both plain and chromicized.

CHAPTER XV

ANOMALIES AND MALFORMATIONS OF THE GENITAL ORGANS

Anomalies and Malformations of the Vulva
- Absence of Vulva
- Double Vulva
- Atresia of Vulva
- Infantile Vulva
- Hypertrophy of Vulva
- Congenital Anomalies of Clitoris

Congenital Fissures of the Vulva

Anatomy and Malformations of the Hymen

Anomalies and Malformations of the Vagina
- Absence
- Atresia and Stenosis
- Double Vagina
- Blind Pouches

Anomalies and Malformations of the Uterus
- Uterus Deficiens
- Uterus Rudimentarius
- Uterus Fœtalis
- Uterus Unicornis
- Uterus Septus
- Uterus Bicornis
- Uterus Didelphys
- Uterus Accessorius

Anomalies and Malformations of the Fallopian Tubes

Anomalies and Malformations of the Ovaries
- Absence of One or Both Ovaries
- Congenital Smallness of One or both Ovaries
- Supernumerary Ovaries
- Congenital Largeness of One or both Ovaries

In view of the fact that malformations and maldevelopments of the genital organs commonly present a multiplicity of deformities in the associated organs, it will be easier to understand the subject if it is considered as a whole. To illustrate: Absence of the vagina suggests the probable absence of the uterus and its appendages; a septum of the vagina suggests the possible presence of a divided uterus, and a uterus of the infantile type suggests the almost certain presence of underdeveloped tubes and ovaries.

ANOMALIES AND MALFORMATIONS OF THE VULVA

Absence of Vulva.—This condition is rare, and is, as a rule, associated with a congenital absence of the internal organs of generation. Absence of one or more of the component structures of the vulva is not of such rare occurrence, and may be found associated with well-formed internal organs of generation.

Double Vulva.—Double vulva is an extremely rare condition.

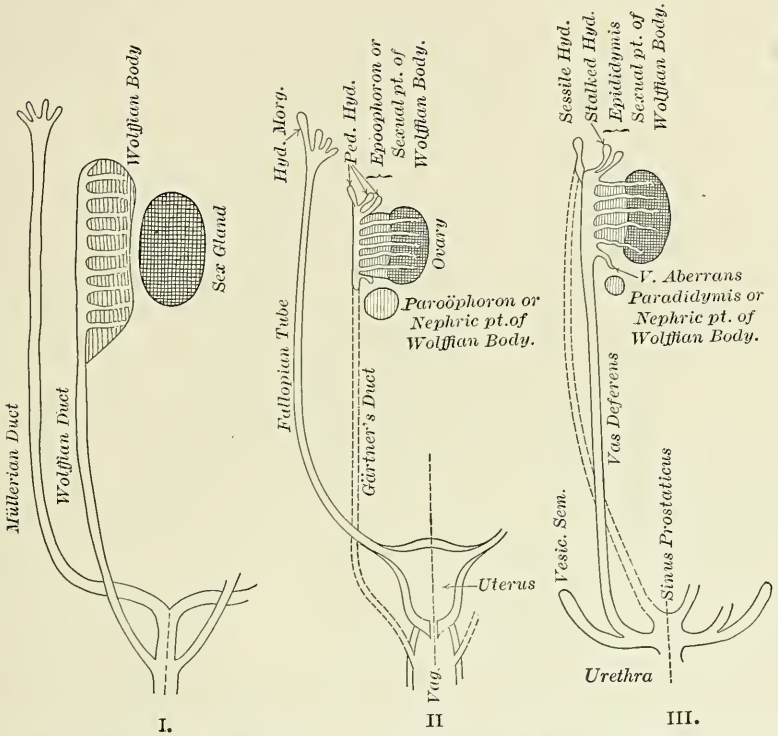
Atresia of Vulva.—Atresia of the vulva may be found associated with a communication between the rectum, bladder, and genital canal. The fetus is rarely viable, but the defect may be found in mature years.

The atresia may be complete. In this case the newborn child will be unable to urinate until the septum is divided. As a rule the coales-

cence is incomplete, there being a small opening through which the urine and menstrual blood escape and through which it is possible for conception to take place, as in one of the author's cases.

Treatment.—The treatment consists in passing a grooved director through the opening and slitting the septum vertically. The vulva is then lightly packed with sterile gauze for three to five days.

FIG. 133



Relationship of the sexual ducts and their rudiments in the two sexes. *I*, the indifferent primary type; *II*, the differentiation in the female; *III*, the differentiation in the male. (Adami.)

Infantile Vulva.—The infantile type of the vulva may be maintained after puberty. The entire vulva, or one or more of the component parts, may fail to mature to the full sexual type. Cretins and dwarfs mostly retain the infantile type. The vulva may mature at the time of puberty, and subsequently undergo atrophic changes involving part or all of the vulva. Such atrophy occurs in wasting diseases in certain nervous disorders, such as epilepsy, and after removal of the ovaries. A physiological atrophy occurs after the menopause.

Hypertrophy of the Vulva.—Hypertrophy of the vulva rarely involves all structures composing the vulva.

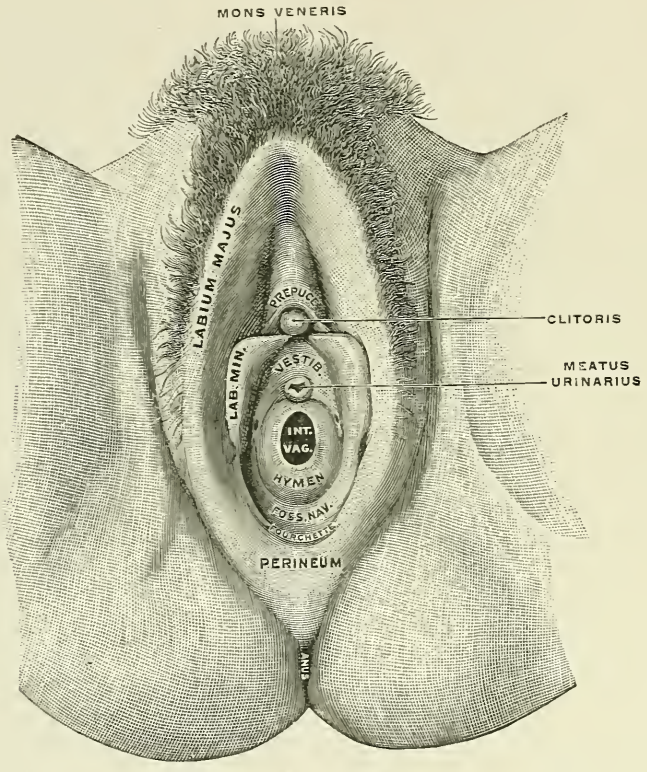
Congenital Anomalies of the Clitoris.—The clitoris may be absent, bifid, small, or large.

Absence.—This is a rare finding.

Atrophy.—Less rare than absence is a congenital hypoplasia of the clitoris.

Hypertrophy.—The clitoris varies in size within normal limits. It has attained the size of the penis. There is no foundation for the belief that masturbation causes the clitoris to enlarge. Syphilis is named as a causal factor.

FIG. 134



Vulva of a virgin. The labia have been widely separated. (Testut.)

Symptoms.—As a rule no symptoms arise, but in some instances the enlarged clitoris may interfere with intercourse and may cause a deflection of the stream in urinating. At times it causes great annoyance by becoming irritated.

Treatment.—No treatment is indicated when there is moderate enlargement. When there is great hypertrophy the clitoris should be removed by a wedge-shaped incision and the stump closed by two or more interrupted sutures of No. 1 chromic catgut. Irritation of the clitoris is relieved by rest, the application of oxide of zinc ointment, or lead water and laudanum lotion. Sitz baths will afford relief.

Adhesions of the Prepuce.—The prepuce may become adherent to the clitoris as the result of uncleanliness and inflammation. It is not

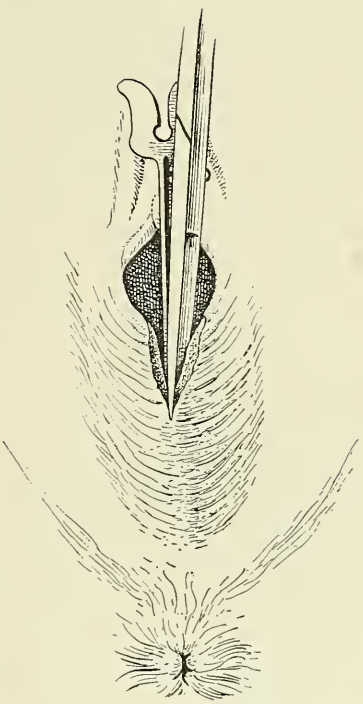
uncommon to find the entire glans of the clitoris covered by an adherent prepuce.

Symptoms.—Local irritation leads to sexual abuses and morbid sexual desires. Some maintain that a long train of nervous disturbances is engendered. When the sebaceous material accumulates under the prepuce, local tenderness and pain may result. Wherever there is local irritation an examination should be made.

Treatment.—Grasp the clitoris between the thumb and index finger, and make backward traction upon the clitoris. If the adhesions do not yield they may be separated by a dissector. It may be necessary to apply a 10 per cent. solution of cocaine before undertaking the procedure. The glans is anointed daily with carbolized vaseline to prevent reformation of adhesions.

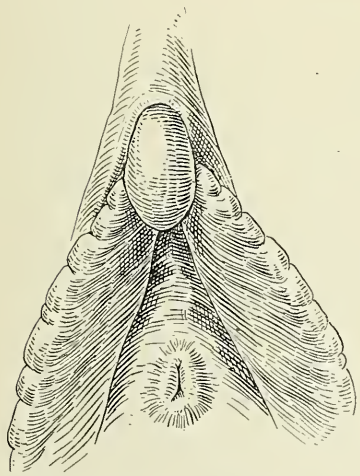
Congenital Fissures of the Vulva.—Epispadias.—Epispadias is caused by failure of closure on the part of the anterior abdominal wall, together with a dehiscence of the anterior wall of the allantois. The allantois thus

Fig. 135



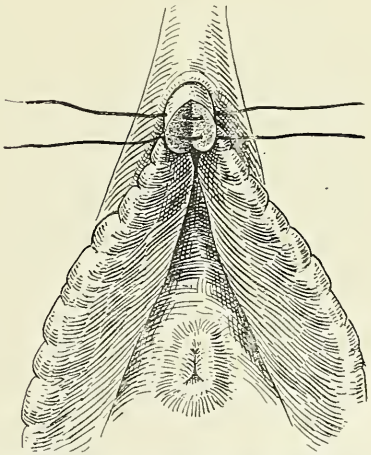
Adherent labia. The vaginal outlet is restored by making a vertical incision along the line of adhesion.

Fig. 136



Hypertrophy of the clitoris.

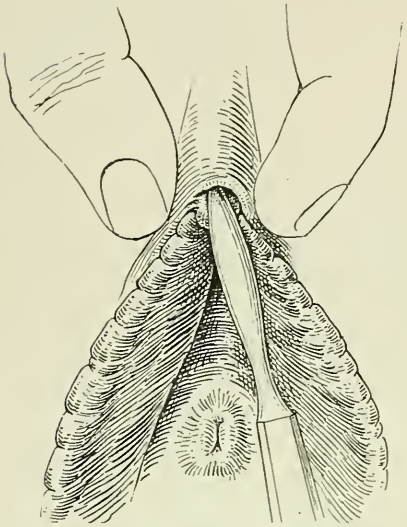
Fig. 137



Amputation of hypertrophied clitoris. A wedge-shaped incision is made and interrupted chromic catgut sutures are passed from side to side. (After Ashton.)

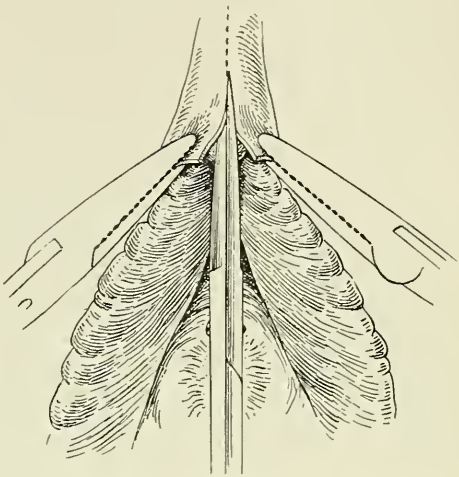
communicates with the outer world. The defect, if possible, should be remedied by a plastic operation. When this is impossible a urinal must be adjusted and the parts kept as clean as possible.

Fig. 138



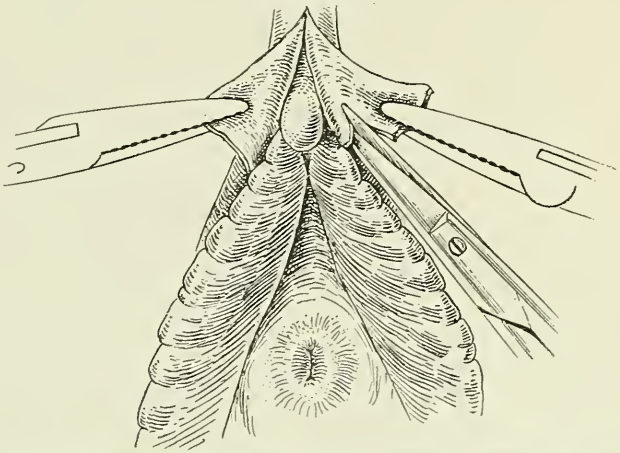
Adhesions of the prepuce. The adhesions are severed by a dissecting instrument. (After Ashton.)

Fig. 139



Redundant prepuce. First step. The prepuce is severed in the median line and the clitoris exposed.

Fig. 140

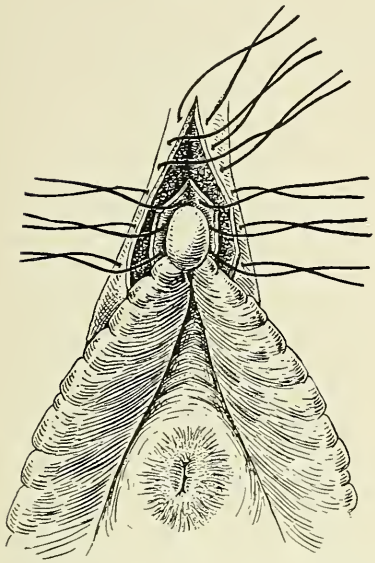


Adherent prepuce. Second step. Either flap of the prepuce is excised with scissors.

Hypospadias.—Hypospadias is formed by a persistence of the urogenital sinus. The urethra and vagina open high up in the vestibular canal. The perineum is well-developed. The urethra may be absent

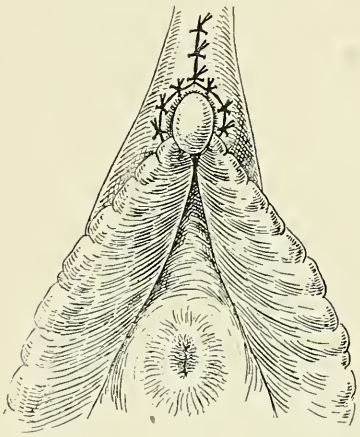
and the bladder communicate directly with the vagina. When there is complete control of the urine no treatment is required, but otherwise an effort should be made to separate and approximate the mucous membrane of the urethra with sutures.

Fig. 141



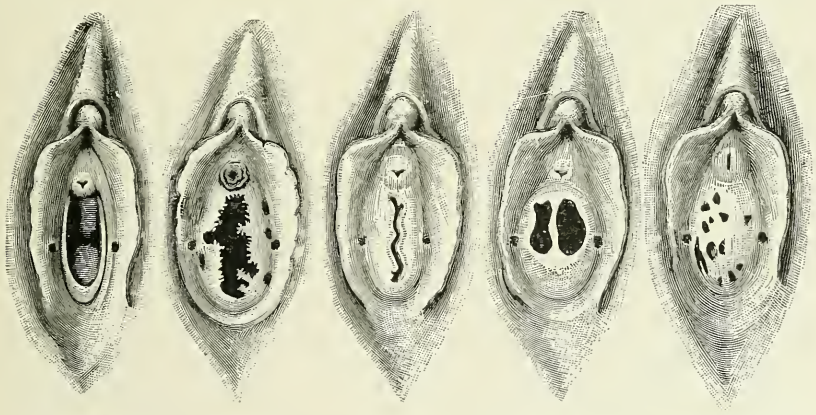
Adherent prepuce. Third step. The sutures of silkworm gut are in place.

Fig. 142



Adherent prepuce. Fourth step. The sutures of silkworm gut are tied. This provides free exposure of the clitoris.

Fig. 143



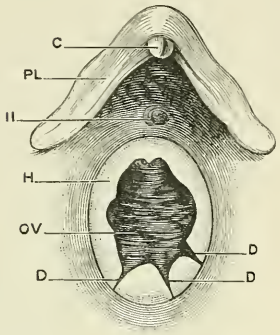
Different forms of hymen. (Testut.)

Anatomy and Malformations of the Hymen.—Physiological rupture and stretching of the hymen occur from sexual intercourse and childbirth.

It is possible for the hymen to be merely stretched in admitting the penis or in the passage of the child.

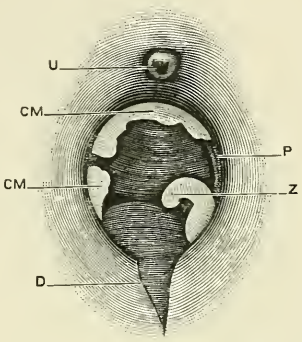
The lacerations occurring from the first coition are usually radial, and do not extend to the base of the hymen. It is possible for the

Fig. 144



Hymen after coitus. (Testut.)

Fig. 145



Hymen after parturition. (Testut.)

Fig. 144.—*C*, clitoris; *PL*, nymphæ; *U*, meatus urinarius; *OV*, vaginal orifice; *H*, hymen; *D*, rents in hymen.

Fig. 145.—*U*, meatus urinarius; *P*, nymphæ; *CM*, carunculæ myrtiformes; *Z*, portion of hymen detached and floating; *D*, a tear through the fourchette.

Fig. 146

Imperforate hymen with hematocolpos.

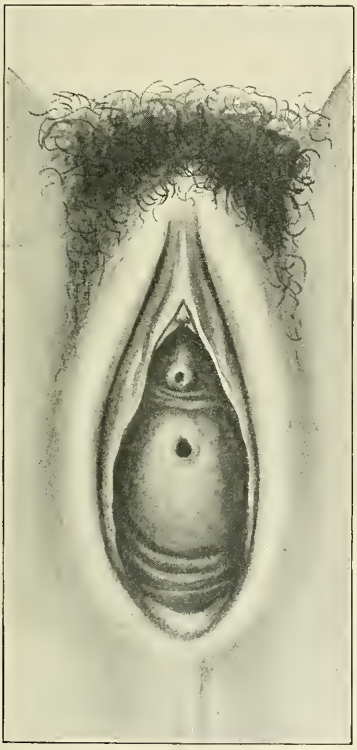
hymen to be partly torn from its base without tearing its free margin. As a rule, there is a circular opening. After childbirth the hymen is completely severed in many places, leaving isolated tags (carunculæ myrtiformes). These lacerations often extend into the vagina and perineum.

The question of the existence or absence of a hymen is of medicolegal importance. It is self-evident that the hymen is not a trustworthy guide in judging virginity. The hymen may be present and intact after sexual intercourse and even after childbirth, while, on the other hand, it may be totally wanting or but partially developed in virgins. It is possible for a lacerated hymen to heal so perfectly that no evidence of a previous laceration is visible.

Malformations of the hymen are congenital or acquired. These malformations are a double hymen, one beside the other, in cases of double vaginæ and a hymen

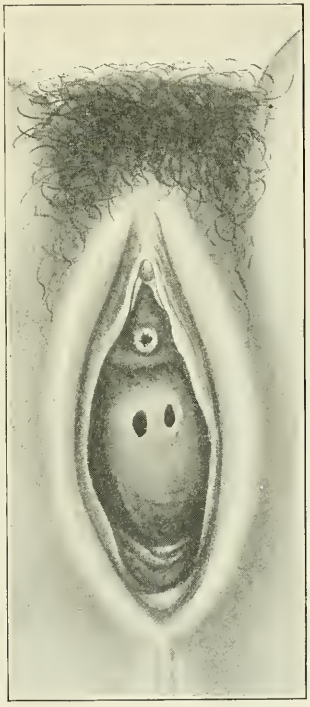
imperforatus in connection with other malformations of the Müllerian tract. Atresia caused by an imperforate hymen may be congenital or acquired. As pointed out by Gellhorn, where the remainder of the genital tract is well-formed the atresia is undoubtedly acquired. Neugebauer has collected from the literature the reports of about 1000 cases of atresia of the hymen. In about one-half of this number the lesion was acquired, and in about one-third of the cases the history gave no suggestion of the cause, whether congenital or acquired. Acute infectious diseases and gonorrhea are responsible for the greater number of acquired atresias.

Fig. 147



Hymen with single minute opening.

Fig. 148



Hymen with two minute openings.

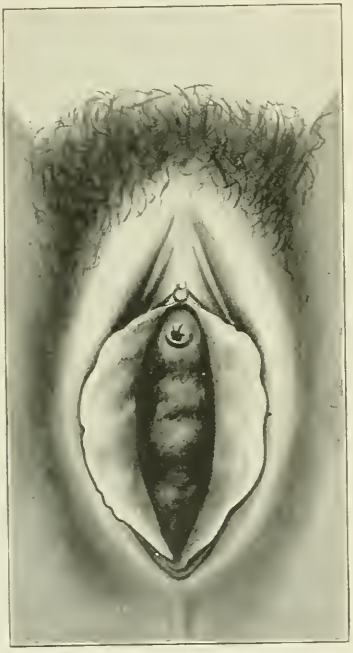
When the hymen presents an obstacle to intercourse it should be dissected away with scissors and the raw edges closed with a running catgut suture.

Cysts of the Hymen.—Little is known of cysts of the hymen. Wenkel made the first report in 1883. Palm describes a cyst of the hymen measuring 8 cm. in diameter. The average diameter is about 1 cm. Many do not exceed 1 mm. in diameter. They are usually congenital,

though they may not be observed until late years. One or more cysts are located near the free margin of the hymen. The presence of a variety of epithelium lining the cyst cavity suggests a variety of sources. As a rule, the epithelium is squamous and stratified, but is occasionally cylindrical, and in a few instances endothelium is found. The origin of the cysts of the hymen is in many cases the epithelial projections; these projections become constricted off, and form the epithelial wall of a space which fills with serum. A few cases apparently arise from Gärtner's duct, from dilated lymph spaces, and from retention of the secretions of sebaceous glands.

In a valued original communication on the "Anatomy, Pathology, and Development of the Hymen," G. Gellhorn[1] presents numerous lesions of the hymen not generally recognized.

Fig. 149



Normal vulva with congenital absence of vagina and uterus.

Inflammations of the hymen are primary or secondary to vulvitis and vaginitis. The inflamed hymen is markedly reddened and bleeds easily. The same changes affect the remains of the hymen (carunculæ myrtiformes). Tumors of the hymen are rare. Gellhorn finds seventeen cases of hymeneal cysts in the literature, two cases of polypi, and one of angioma. Sänger reported a case of primary sarcoma of the hymen. As yet no case of primary carcinoma of the hymen has been reported.

ANOMALIES AND MALFORMATIONS OF THE VAGINA

Inasmuch as the vagina is partly developed from the ducts of Müller, developmental failures, analogous to those found in the uterus and tubes, are to be found in the vagina. There may be a complete absence or a partial development of the vagina; the ducts of Müller may fail to coalesce, giving rise to a double vagina; the ducts of Müller may coalesce but fail to be absorbed, leaving a partial or complete septum, dividing the vagina in the median line.

Absence of the Vagina.—Absence of the vagina may result either from failure of the ducts of Müller to develop or from complete atresia. As a rule the entire Müllerian tract fails to develop, hence

[1] Amer. Jour. of Obstet., August, 1904.

PLATE XIV

Fig. 1

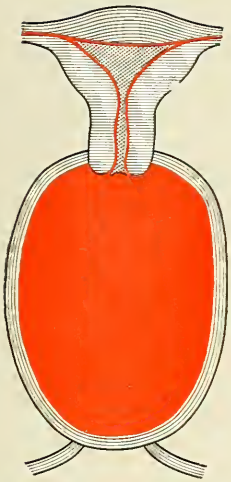


Fig. 2

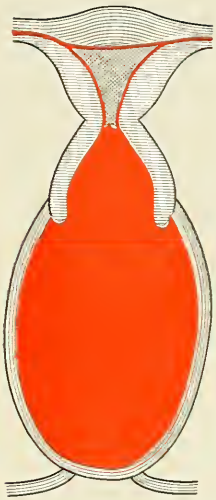


FIG. 1.—Atresia at the vulva first causes distention of the vagina, producing hematocolpos. (Sutton and Giles.)

FIG. 2.—Atresia at the vulva. Hematotrachelos has followed hematocolpos. (Sutton and Giles.)

Fig. 3

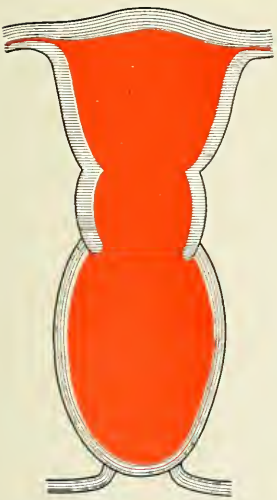


Fig. 4

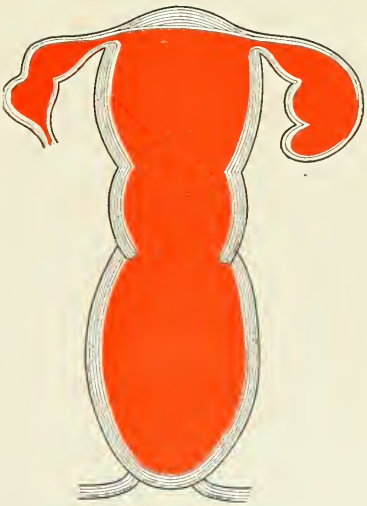


FIG. 3.—Atresia of the vulva has caused hematocolpos, then hematotrachelos, and then hematometra. (Sutton and Giles.)

FIG. 4.—Atresia at the vulva. In addition to the conditions in Fig. 3, there is added hematosalpinx. (Sutton and Giles.)

PLATE XV

Fig. 1

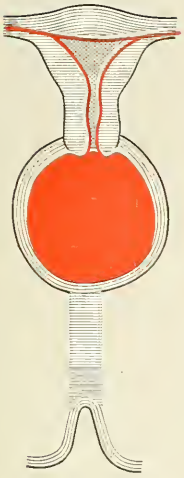


Fig. 2

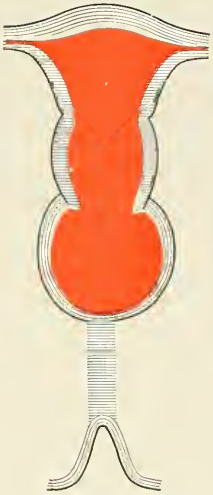


Fig. 3

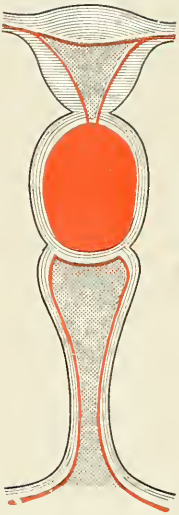


FIG. 1.—Atresia in the vagina midway between the vulva and the os externum, causing hematocolpos in the upper half of the vagina. (Sutton and Giles.)

FIG. 2.—Same as in Fig. 1, except that distention of the whole uterus has followed the partial hematocolpos. (Sutton and Giles.)

FIG. 3.—Atresia of the os externum, producing a hematotrachelos. Corpus uteri not yet distended. (Sutton and Giles.)

Fig. 4

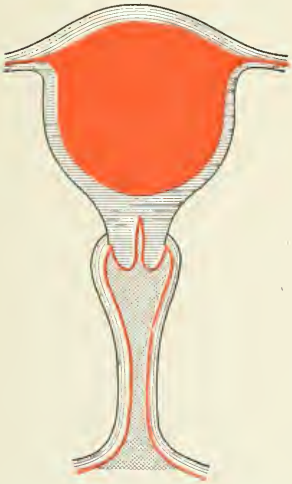


Fig. 5

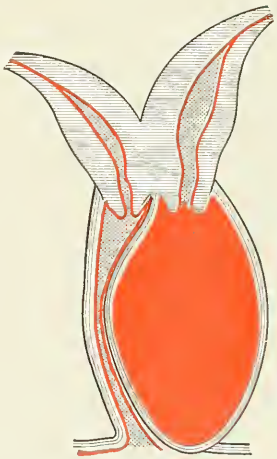


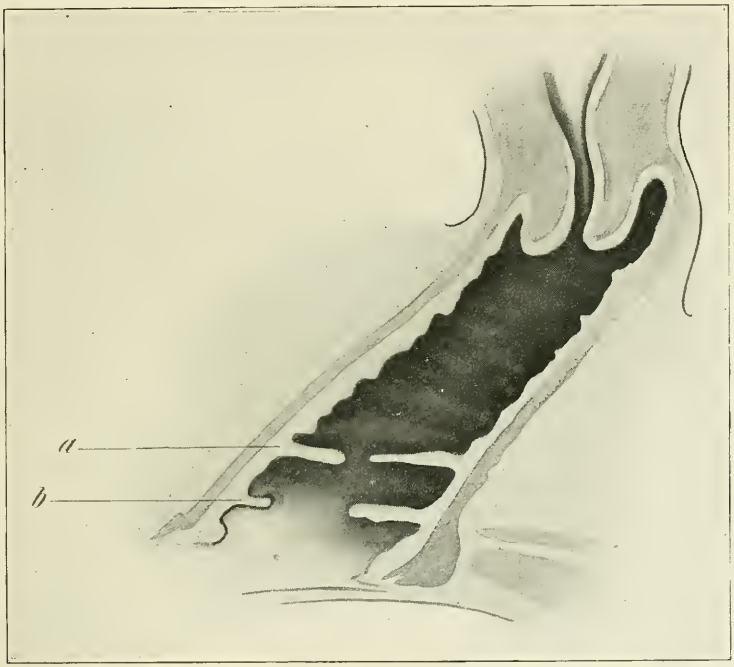
FIG. 4.—Atresia of the os internum, producing hematometra. Fallopian tubes may become distended later. (Sutton and Giles.)

FIG. 5.—Atresia of the vulva on one side of a double uterus and vagina, causing a hematocolpos on the affected side. (Sutton and Giles.)

the absence of the vagina, uterus, and tubes. The appearance of the external organs of generation may be misleading in determining the sex. Part or all of the vagina may be found wanting, due to a lack of canalization of part or all of the lower segment of the ducts of Müller.

Symptoms.—No symptoms arise until the time of puberty. At this time the attention of the mother is called to the failure of the menses to appear. If the upper genitals fail to develop, the only complaint is that of amenorrhea; but if the uterus, tubes, and ovaries develop to the stage of functional activity the menstrual blood will accumulate in the uterus and tubes, and give rise to the presence of a

FIG. 150



Incomplete transverse septum of the vagina: *a*, septum; *b*, hymen.

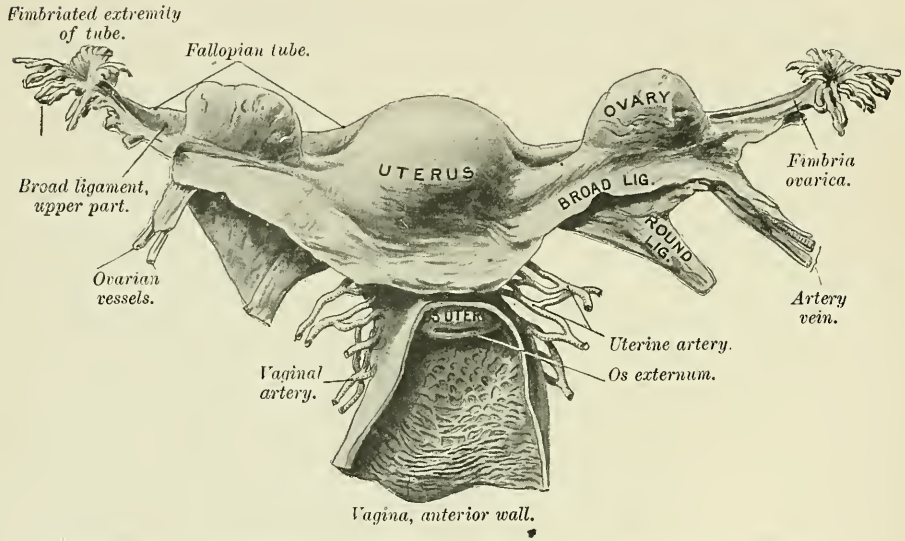
tumor in the pelvis as outlined in Plates XIV and XV. On examination the vagina will be found to be absent, and there will be discovered a fluctuating tumor above the pelvis and extending down into the pelvis. This tumor is observed to increase in size with each menstrual epoch. Occasionally the absence of the vagina is not observed until after marriage.

Treatment.—When the menstrual molimina are not experienced no treatment is advised unless it is desired to make an artificial vagina to provide for sexual intercourse—a procedure that should be undertaken with caution because of its many failures. When, however,

the uterus, tubes, and ovaries are developed it becomes imperative to provide an outlet for the menstrual blood.

Making an Artificial Vagina.—A sound is placed in the bladder and the index finger of the left hand is inserted into the rectum. A transverse incision is then made with the knife immediately in front of the anus. A dissection is then made between the bladder and rectum, with fingers and dissecting scissors, until the cervix is reached. The opening is spread widely by the fingers or forceps and the contained blood is washed away with an antiseptic solution. When the blood does not readily escape from the uterus the cervix must be dilated and the uterus irrigated. The utmost caution should be observed to prevent

FIG. 151



The uterus and its appendages. Posterior view. The parts have been somewhat displaced from their proper position in the preparation of the specimen; thus the right ovary has been raised above the Fallopian tube and the fimbriated extremities of the tubes have been turned upward and outward. (From a preparation in the Museum of the Royal College of Surgeons of England.)

infection. To prevent subsequent contraction and obliteration of the newly formed channel an effort should be made to transfer a flap of skin from the perineum or labia to the walls of the channel. When this fails a glass plug should be introduced and worn, not only until healing has been effected, but for an indefinite time, to prevent subsequent contraction. Failure to provide an artificial outlet for the menstrual blood calls for an abdominal supravaginal hysterectomy, leaving the ovaries *in situ*.

Atresia and Stenosis of the Vagina.—As a rule, atresia of the vagina is incomplete. It is usually the lower segment that is closed. In extreme cases only a fibrous or fibromuscular band is found between the bladder and rectum. Back of the obstruction the menstrual blood

collects in the vagina (hematocolpos); in the uterus (hematometra); in the tubes (hematosalpinx), and, finally, in the pelvis (hematocele). The obstructing tissue may be stretched and crowded down, appearing at the vulvar outlet as a dark bluish-red membrane. The retained blood does not usually coagulate, but becomes dark in color.

Etiology.—Atresia of the vagina may be congenital or acquired. It may be difficult to determine whether the malformation is developed in intra-uterine or in extra-uterine life. In young infants a vaginitis may form adhesions of the vaginal surfaces without giving rise to symptoms. Whether a fetal vaginitis can account for congenital atresia of the vagina has not been demonstrated. The usual cause of stenosis and atresia of the vagina, occurring during the period of sexual maturity, is trauma incident to labor.

In the postclimacteric stage an adhesive vaginitis may narrow or obliterate the vagina. Gonorrhea is the usual underlying cause of senile vaginitis. In congenital atresia the obstruction is most often at the junction of the middle and upper thirds of the vagina, which is the lower limit of the Müllerian ducts. In the acquired form the obstruction is usually similarly situated. The obstruction may be merely a half-moon or annular ring, a partial or complete septum with perforations, or a membrane varying in thickness, even to filling the vagina completely. Two, three, and even four atresic points have been described.

Diagnosis.—The diagnosis of stenosis and atresia of the vagina should present few difficulties. When a girl at the time of puberty fails to menstruate, but suffers from pain in the pelvis, which increases in severity at the time of each monthly period, atresia of the vagina or cervix is suspected. If, in addition, a pelvic tumor develops and fluctuates distinctly, the diagnosis is highly probable, but must be confirmed by a vaginal examination. Vicarious menstruation rarely occurs. In an attempt to make a digital examination of the vagina the finger will meet the obstruction. The extent of the closure is best determined by the finger in the rectum. If the obstruction lies high in the vagina and does not bulge downward it is not likely that there is any considerable secretion pent up above the point of obstruction (Fig. 152).

Hematometra is not easy to demonstrate, because of difficulty in palpating the elevated uterus through the rectum. The uterus usually lies near the median line, and is rounded, tense, possibly fluctuating, and somewhat increased in size.

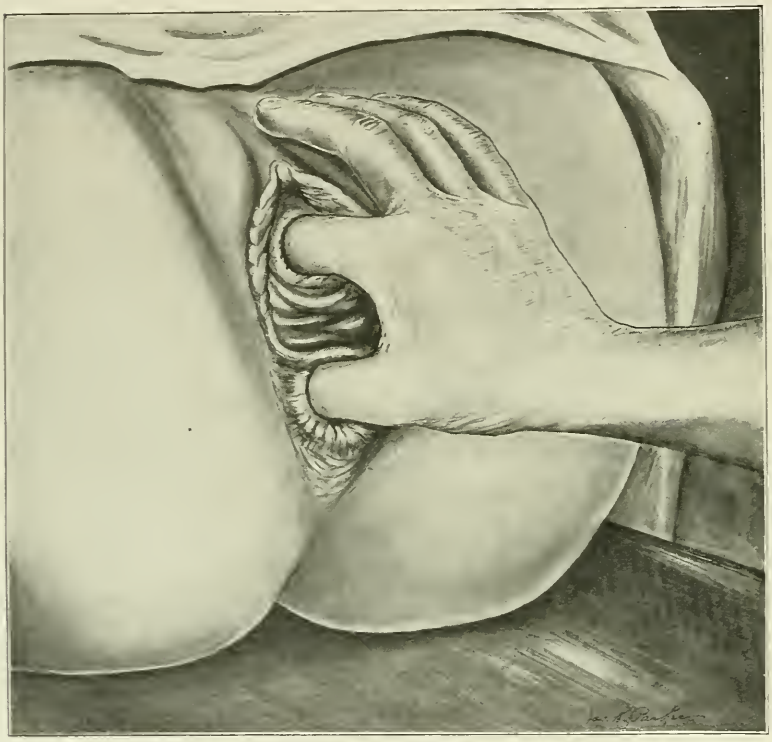
Treatment.—When the narrowing of the vagina does not present an obstruction to the menstrual flow or interfere with intercourse no treatment is advised.

Forcible Stretching under Anesthesia.—This will suffice to remove some of the partial obstructions.

Excision and Incision of Septa.—Excision of septa and whipping the raw edges with a continuous catgut suture, or the making of a crucial incision through the septum and packing the vagina with iodoform

gauze for three days are the usual methods employed. When there is accumulated blood above the point of obstruction the operation must be done with every possible surgical precaution to prevent infection.

Fig. 152



Vaginal septum. The index finger inserted into the urethra and the thumb into the rectum are approximated, and by so doing the atresic vagina is demonstrated.

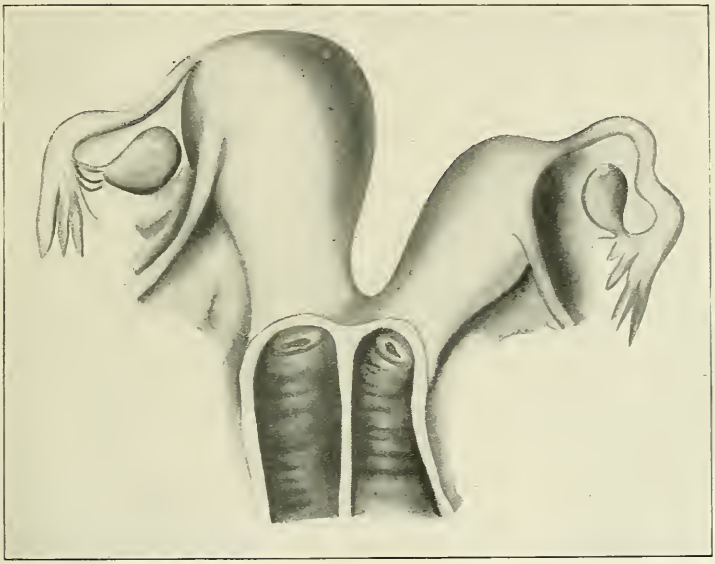
When blood has accumulated in the vagina or in the vagina and uterus the field of operation is made sterile, an incision is made in the septum and the pent-up blood is allowed to escape. If the uterus is distended the cervix is carefully dilated to permit the escape of the blood. After the blood has escaped, both the vagina and uterus are irrigated with an antiseptic solution, notably bichloride of mercury, 1 to 2000, and this is followed by a copious irrigation with sterile normal salt solution. The vagina is then loosely packed with iodoform gauze. The gauze is removed at the end of twenty-four hours, and afterward the vagina is irrigated with a mild antiseptic solution once or twice daily. The vulva is protected at all times by a sterile gauze pad held in place by a T-binder. When the tubes are distended great caution must be exercised in manipulating the uterus for fear of

rupturing the tubes. Rest should be enjoined, and if signs of infection arise an ice-bag should be applied over the lower abdomen.

If blood has escaped into the free pelvic cavity it should be given time for absorption, and if this does not occur, or if the blood becomes infected, vaginal drainage should be established through an opening into the cul-de-sac of Douglas.

Double Vagina.—Double vagina is the result of failure on the part of the Müllerian ducts to fuse perfectly. From this cause a septum divides the vagina in part or throughout. The vaginal canals usually lie side by side, the septum running anteroposteriorly. The canals may be unequal in size. The septum rarely runs transversely, so dividing

Fig. 153



Uterus didelphys, with double vagina.

the vagina that one lies in front of the other—this can only be accounted for on the supposition that the Müllerian ducts had rotated prior to their fusion. All degrees of development may be observed in the septum, from a slight ridge to a complete partition composed of fibrous tissue, mingled with some muscle fibers and covered on either side with mucous membrane. The cervix and uterine body are usually divided. If both canals are pervious no symptoms need arise until labor, when there may be an obstruction to the passage of the child.

No treatment is advised unless the septum interferes with intercourse or with childbearing. In either event the septum should be excised with scissors and the raw edges stitched with a continuous suture of catgut, after which the vagina is packed loosely with iodoform gauze for one or two days.

Blind Pouches.—Pouches, varying in size to an inch in length, are rarely formed in the lateral walls of the vagina. These pouches may serve as a receptacle of infection, and in this event it may be necessary to open them up freely to provide drainage.

ANOMALIES AND MALFORMATIONS OF THE UTERUS

The anomalies and malformations of the uterus are classified according to their origin as follows:

I. Those Due to Imperfect Development of Müller's Duct:
   1. Uterus deficiens.
   2. Uterus rudimentarius.
   3. Uterus fetalis (infantile uterus).
   4. Uterus unicornis.

II. Those Due to Imperfect Blending of Müller's Ducts:
   1. Uterus septus (bilocularis).
   2. Uterus bicornis.
   3. Uterus didelphys (uterus duplex, uterus separatus).
   4. Uterus accessorius.

Uterus Deficiens.—It is very unusual to find a complete absence of the uterus in an adult. When found there is usually also an absence of the entire genital tract, or only a rudimentary development of the vulva, vagina, tubes, and ovaries. The round ligaments may be present, though poorly developed. If the ovaries are present the menstrual molimina will be experienced, and vicarious menstruation may occur. There may or may not be sexual desire.

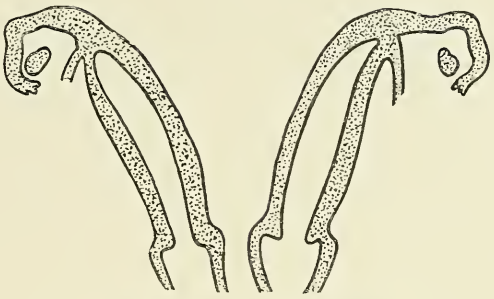
It has been found in such malformations as acephalia, but to find no trace of the uterus in viable fetuses or adults is indeed rare. A bilobed uterus has been mistaken in postmortem examinations for the Fallopian tubes, and a hollow rudimentary uterus for the vagina.

There may be no evidence of a uterus other than a thickening of the posterior vesical wall, or a smooth band continuous above with the tubes and below with the round ligaments, or the broad ligaments may be thickened in places by uterine tissue. It is manifestly impossible to make a clinical distinction between such rudimentary conditions and complete absence of the uterus. Mistakes have been made in anatomical dissections.

The ovaries are often normal. In fact, the general psychical and physical development is usually perfect. Periodic ovulation seldom occurs. A scanty, bloody discharge occasionally comes from the vagina, but has not been demonstrated to be a menstrual flow. Vicarious hemorrhages from the nose and rectum have been reported.

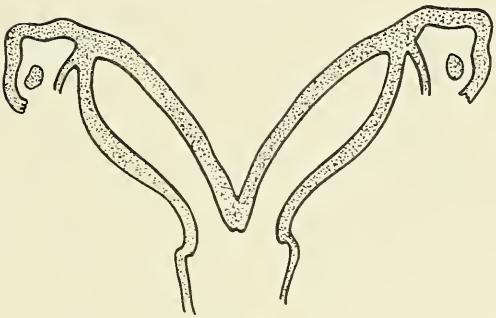
The condition is usually recognized in the effort to determine the cause of amenorrhea and sterility. The examination is best made per rectum. A sound placed in the bladder can be palpated along its entire course within the bladder by the finger in the rectum. If the uterus were well developed this would be impossible.

Fig. 154



Uterus didelphys with double vagina.

Fig. 155

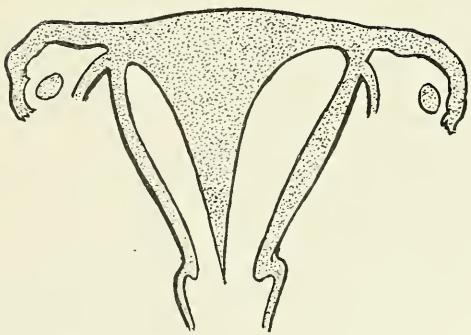


Uterus bicornis bicollis.

Fig. 156

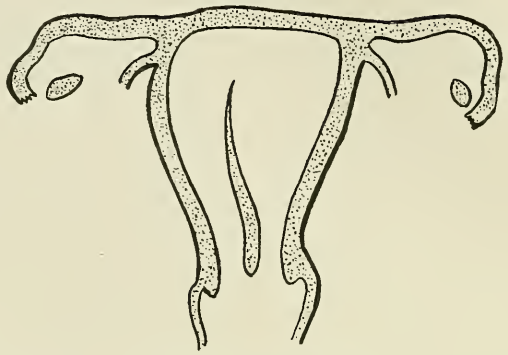
Uterus unicornis.

Fig. 157



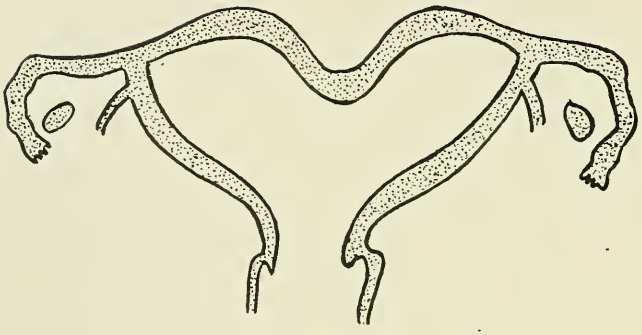
Uterus septale.

FIG. 158



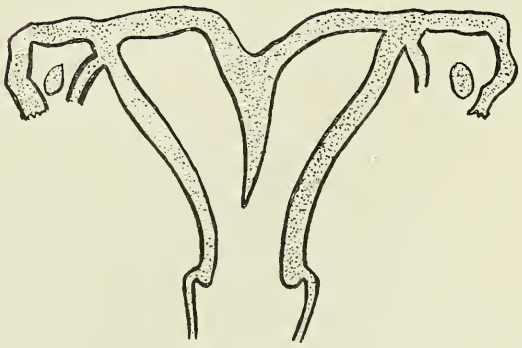
Uterus subseptate bicollis.

FIG. 159



Uterus bicornis unicollis.

FIG. 160

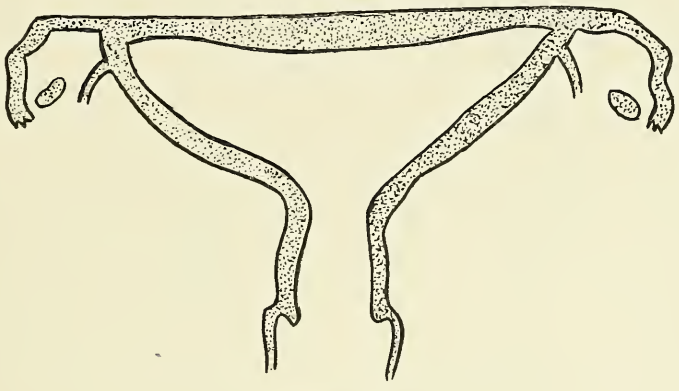


Uterus subseptate.

The differential diagnosis between a complete absence of the uterus and a rudimentary uterus is scarcely possible without making an exploratory incision. Placing a sound within the bladder and directing an assistant to hold it while proceeding with a recto-abdominal examination will demonstrate either an entire absence or a rudimentary development of the uterus (Fig. 162).

Uterus Rudimentarius.—As the name implies, the uterus is rudimentary in its development. It remains as a fibromuscular body, ill formed and undersized. The walls may be so thin as to suggest the name uterus membranaceus. The cervix, adnexæ, ligaments, and vagina are likewise rudimentary or absent. The external genitals may be well-formed, though this is not probable. As already stated, a diagnosis cannot be made from complete absence of the uterus unless by abdominal section.

FIG. 161



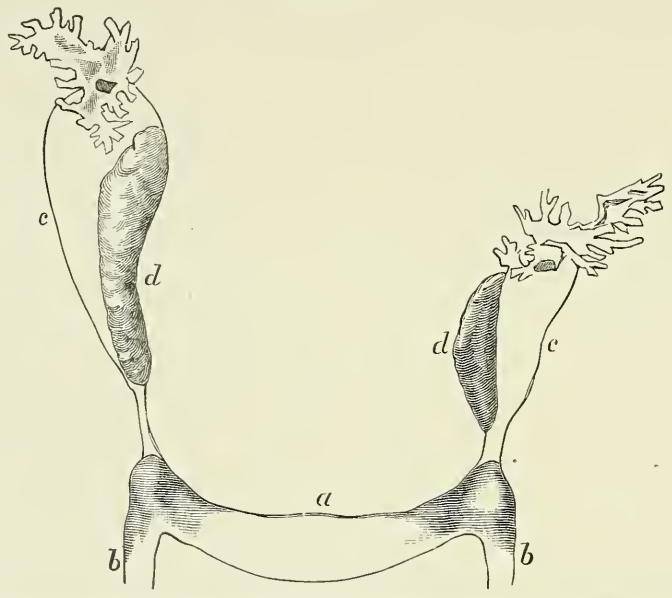
Uterus incudiformis.

Uterus Fœtalis (Infantile Uterus).—The uterus and adnexæ remain like those of fetal life or early infancy—they are undersized. No sharp distinction can be made in these cases. In general it may be stated that a uterus is infantile when the cervix is larger than the corpus uteri, the walls thin, and the long axis of the uterus less than two inches. A better term would be hypoplasia uteri. Aside from the size, the most striking feature of the fetal or infant uterus is the disproportion between the cervix and the body of the uterus. The cervix is two-thirds the length of the whole organ, the body one-third. In the mature uterus the cervix is one-third the length of the whole organ, the body two-thirds. Again, the arbor vitæ in the fetal or infantile uterus extend the entire length of the uterine cavity, while in the adult uterus the mucosa of the body is smooth and the arbor vitæ extend only the length of the cervix. Still another feature of the fetal or infantile uterus is the absence of a fundus; the top of the uterus is either flat or depressed, while in the adult uterus it is convex.

The vagina is usually shorter and narrower than is normal, but, as a rule, it is well formed. The vulva may be poorly developed and the breasts likewise, but this is not the rule.

A general hypoplasia of the whole cardiovascular system is said to be an underlying factor in this developmental failure. Chlorosis, scrofula, and the general wasting diseases are given as general predisposing causes. No general cause can account for local hypoplasia when the other structures of the body are well developed. Cretins and dwarfs commonly possess fetal or infantile uteri, but not infrequently there is perfect general physical development. It is probable that the developmental failure lies primarily in the ovaries.

FIG. 162



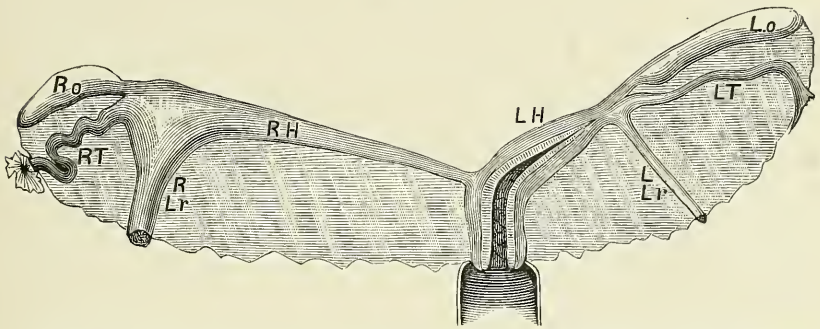
a, ribbon-shaped rudiment of the uterus; *b*, *b*, round ligaments; *c*, *c*, Fallopian tubes; *d*, *d*, ovaries. (Mann.)

The clinical diagnosis is not difficult. Primary amenorrhea should always suggest the probable existence of an infantile uterus. Sterility is invariably present. If the patient has menstruated normally, or if she has ever been pregnant, there is no possibility of an infantile or fetal uterus. A small vagina and vaginal portion of the cervix suggest a small uterus. A recto-abdominal examination under anesthesia is preferred. When the uterine canal will admit a sound the measurement of the length of the uterus may be made, and an estimate of the thickness of the wall can be arrived at by a conjoined recto-abdominal examination, the sound remaining in the uterus.

Uterus Unicornis.—Only a single horn of the uterus is developed; the opposite horn is either absent or rudimentary.

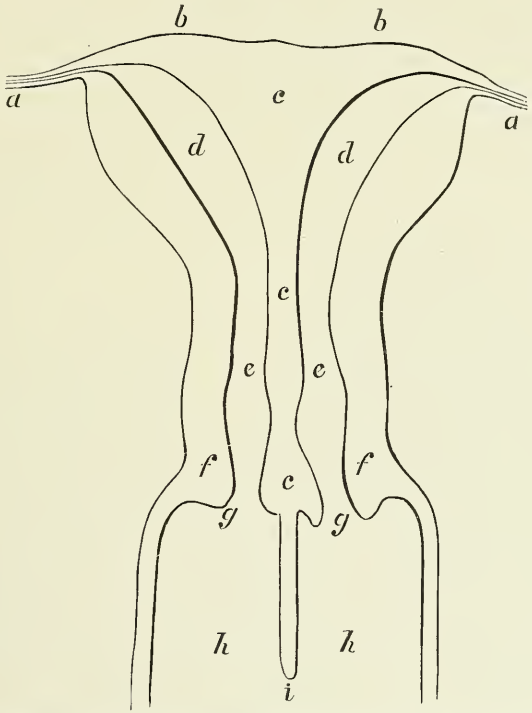
The explanation of this defect lies either in a partial or complete failure of one Müllerian duct to develop. The single horn tapers off into the tube. At the juncture of the horn and the tube the round

FIG. 163



Uterus unicornis: *LH*, left horn; *LT*, left tube; *Lo*, left ovary; *RH*, right horn; *RT*, right tube; *Ro*, right ovary; *RLr*, right round ligament; *LLr*, left round ligament. (Mann.)

FIG. 164



Uterus septus duplex (natural size), completely double uterus, and incompletely double vagina of a girl, aged twenty-two years: *a*, *a*, tubes; *b*, *b*, fundus of the double uterus; *c*, *c*, *c*, partition of uterus; *d*, *d*, cavities of the uterine bodies; *e*, *e*, internal orifices; *f*, *f*, external walls of the two necks; *g*, *g*, external orifices; *h*, *h*, vaginal canals; *i*, partition which divided the upper third of the vagina into two halves. (Mann.)

ligament is given off. There is no fundus. The vagina and cervix are small, and may be divided partially or completely by a septum. The ovaries and tubes may be rudimentary or absent; so, also, the bladder and kidney may be undeveloped, or there may be absence of the kidney on the side opposite the single horn. The cervix is small and the virgin vagina is narrow. The deformity is difficult to distinguish clinically from the infantile uterus. The lateral deflection of the uterus is highly suggestive.

Sterility is the rule, though pregnancy in a rudimentary horn is possible. Amenorrhea is common, but the menstrual functions may proceed regularly. When pregnancy exists in a rudimentary horn the condition is not unlike tubal pregnancy in its clinical aspect. The dangers of rupture and of hemorrhage are the same. There is no way of making a distinction between these two conditions save by abdominal section, unless, as is possible in exceptional cases, the gestation sac is demonstrated by abdominal palpation to lie within the attachment of the round ligament. In tubal pregnancy the gestation sac lies external to the attachment of the round ligament.

Uterus Septus (Bilocularis).—The uterus is divided by a vertical septum, extending a variable distance from the external os to the fundus. On the exterior there is no evidence of a septum. The uterus is broader and more globular than is the perfectly developed organ. Not infrequently the vagina is septate. Various explanatory terms have been applied to the several degrees of the septate uterus—*i. e.*, uterus biforis supra simplex, where the septum is only found near the external os; uterus subseptus unicorporens, where the septum is found in only a part of the cervix and body; uterus subseptus unicellis, where the septum is found in the body, not in the cervix; and uterus subseptus uniforis, where the septum completely divides the body and cervix, there being a single external os.

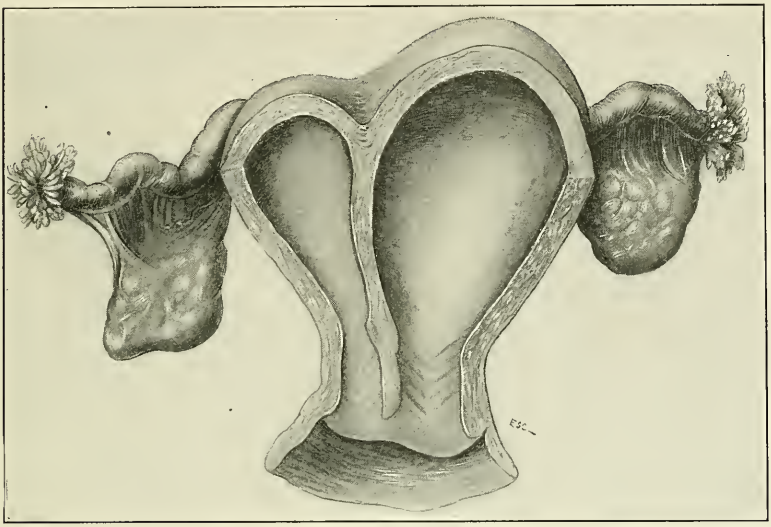
Uterus Bicornis.—The two horns of the uterus are united to a limited and variable degree, the union taking place from below upward. The two halves of the uterus are rarely developed equally. All gradations are observed between the uterus unicornis with a rudimentary second horn and the uterus bicornis with both horns fully developed. The tubes and ovaries are usually normal, but the vagina often participates in the duplexity. The degree of separation varies from completely divided bodies with a single cervix to a union of the two horns, leaving but a notch in the fundus. The two horns are not always of equal size, and may not lie on the same plane. A septum may partially or completely divide the cervix and vagina. One or both horns may be imperforate. The external genitals are usually normal (Fig. 166).

In addition to this and other anomalies in the development of the genital organs there may be maldevelopments of the urinary tract—*e. g.*, ectopia vesicæ—and absence of or congenital atrophy of the kidney.

The behavior of a uterus bicornis is similar to that of the uterus septus. Menstrual disorders are common. Amenorrhea may result from atresia of the lower genital tract, or from an imperforate lumen

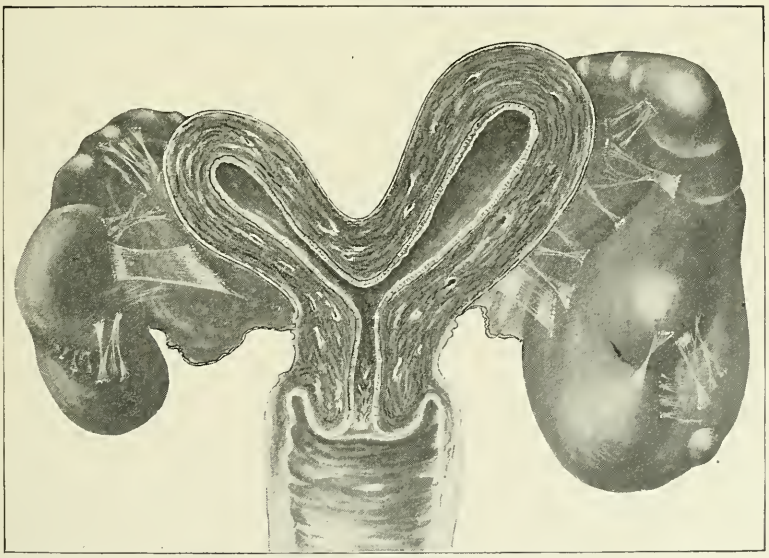
in both horns of the uterus. The menses may flow simultaneously from the two horns or alternately at intervals of from two to four weeks. When one horn or one-half of a septate uterus is pregnant the opposite

FIG. 165



Septate uterus. Left side recently contained a full-term fetus. Sketch of postmortem specimen.

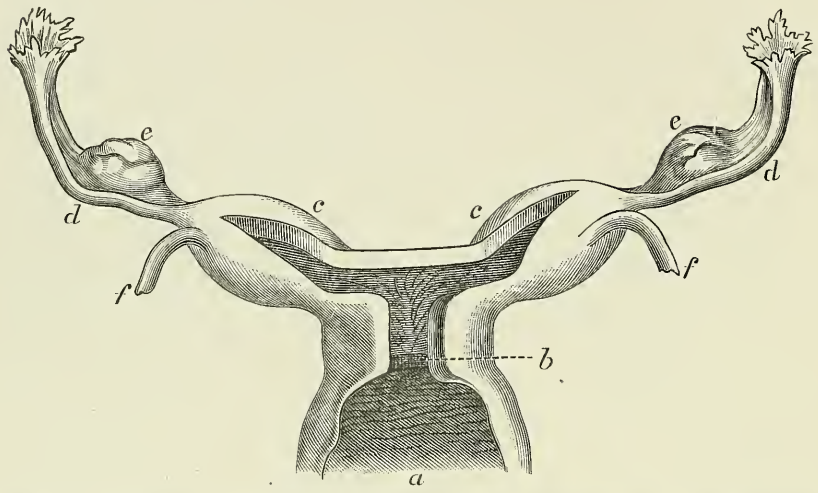
FIG. 166



Bicornate uterus with bilateral tuboövarian abscesses. The specimen was removed post mortem. The patient refused operation and died of general suppurative peritonitis. Four children had been born, probably from the larger horn.

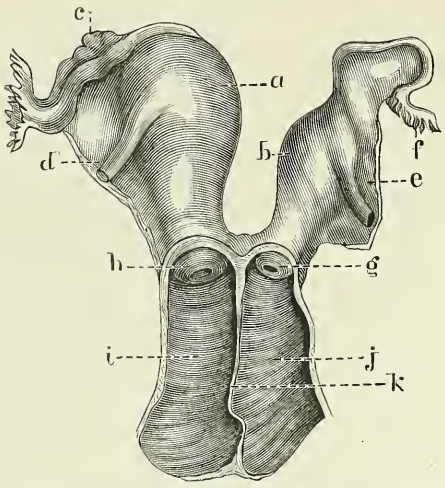
side may continue to menstruate or may become pregnant at any time during the period of gestation in the other side. A decidua may form

FIG. 167



Uterus bicornis unicellis: *a*, vagina laid open; *b*, single cervix; *c*, *c*, uterine horns; *f*, *f*, round ligaments; *d*, *d*, Fallopian tubes; *e*, *e*, ovaries. (Mann.)

FIG. 168

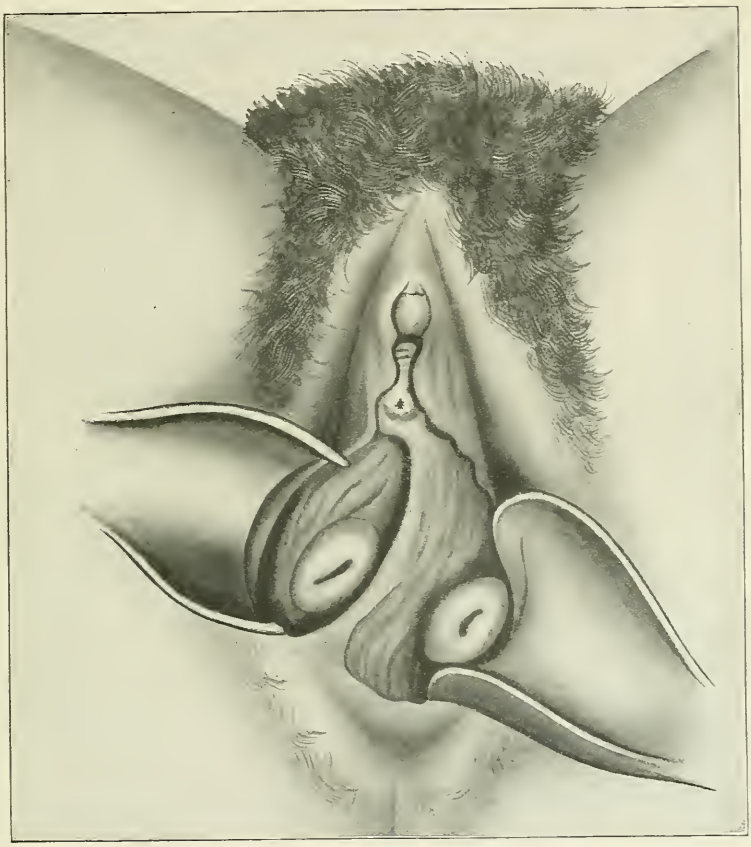


Double uterus (uterus didelphys): *a*, right cavity; *b*, left cavity; *c*, right ovary; *d*, right round ligament; *e*, left round ligament; *f*, left tube; *g*, left vaginal portion; *h*, right vaginal portion; *i*, right vagina; *j*, left vagina; *k*, partition between the two vaginæ. (Mann.)

in the non-gravid side and be discharged at labor. Pregnancy and labor may progress normally, and uterine contractions occur in both horns. This, however, is not the rule. The uterine contractions are

seldom regular and strong; malpositions and malpresentations of the child are common; placenta prævia and premature detachment of the placenta may occur at any time, and rupture of the uterus during labor is always to be feared.

Fig. 169



Uterus didelphys, showing the two cervices presenting in the vaginal vaults.

The presence of a uterus bicornis or uterus septus is often not suspected, even after marriage and childbirth. A double vagina or a double cervix will suggest the presence of a septate or bicornate uterus. When pregnancy does not exist the finger or sound will aid in the diagnosis. Under anesthesia the separate horn may be detected by bimanual examination. Involution is rarely as perfect in the puerperium as in the normal uterus, and displacements and subinvolution are liable to develop with all their remote consequences. Placental tissue is likely to be retained in the uterus and lead to infection and hemorrhage.

Uterus Didelphys (Uterus Duplex, Uterus Separatus).—Not only the uterine horns but the cervix as well is completely divided. Each half is equipped with a single tube, ovary, and round ligament. The vagina may be single, double, or partially divided. The two halves may be in different planes and of unequal size. One or both sides may be imperforate. All that has been said of the clinical features of a bicornate uterus will apply to a uterus didelphys.

Uterus Accessorius.—This is the rarest of anomalies in the development of the uterus. Hollander and Skene each observed a case in which a small uterus was situated in front of a normal uterus, the two bodies joined at the internal os. The accessory uterus had no adnexæ and no round ligaments. The probable explanation of this anomaly is that a diverticulum of Müller's duct developed into an accessory uterus. In Hollander's case the patient gave birth to seven children. In an abdominal section placental tissue was found in the accessory uterus. In Skene's case there was a leucorrheal discharge from the accessory organ.

ANOMALIES AND MALFORMATIONS OF THE FALLOPIAN TUBES

1. Both tubes may be wanting, in which case the uterus is commonly absent.
2. A single tube may be wanting, in which case the corresponding side of the uterus is usually absent.
3. One or both tubes may be rudimentary and associated with a rudimentary uterus. The tubes may remain infantile in type, very greatly convoluted, and have a small lumen.
4. The lumen of the tube may be partially or completely obliterated or may be abnormally large.
5. Rudimentary tubes or fimbriæ may spring from the main tube. Leading into the main tube through the accessory tubes and fimbriæ are rudimentary canals and ostia.

Webster resected the fimbriated end of a tube; some months later the abdominal cavity was again opened and the fimbriæ were found to be regenerated.

6. Diverticula of the endosalpinx are sometimes present, and are known to be a cause of tubal pregnancy.

ANOMALIES AND MALFORMATIONS OF THE OVARIES

Absence of One or both Ovaries.—This may occur as a congenital defect, or the entire ovarian tissue may be completely lost through the development of atrophic changes or new-formations. When both ovaries are absent the uterus and tubes are either altogether wanting or poorly developed. Menstruation and childbearing are impossible.

In a case reported by Quain there was vicarious menstruation from the nose. Two of Martin's cases were sexual perverts: one a nymphomaniac, the other a prostitute. Martin collected twenty-two cases of congenital absence of one ovary. In one of his cases the uterus was normal, but the right tube and ovary were absent. In another the uterus and vagina were rudimentary, and the left tube and ovary absent. In nine of the twenty-two cases there was a uterus unicornis. The vagina and vulva are seldom influenced by the absence of a single ovary, and may be well-formed when both ovaries are absent. Torsion of the tube or adhesions surrounding the tube and ovary may shut off the blood-supply and cause complete atrophy of the ovary. The diagnosis of the absence of one or both ovaries can only be made by inspection after the abdomen is opened.

Congenital Smallness of One or both Ovaries.—This condition may be primary or secondary. Martin reports thirty-six cases of rudimentary ovaries; none menstruated, and only seven experienced the molimina. Twelve of the thirty-six had a rudimentary vagina, and in every case the uterus was under size. Rudimentary ovaries have been recognized by a conjoined examination, though this is exceptional.

Supernumerary Ovaries.—Supernumerary ovaries are accounted for either as an acquired segmentation of the ovary or as a congenital defect. In 500 cases supernumerary ovaries were found eighteen times by von Wenkel. Sänger reported one that measured 1 cm. by 0.04 cm.; as a rule, they are much smaller. Pregnancy following the removal of both ovaries is explained by the presence of a supernumerary ovary. A true supernumerary ovary is rarely found, but an accessory ovary constricted off by adhesions is a comparatively frequent lesion. These accessory ovaries may be connected with the ovary by a pedicle or be completely isolated. Small pedunculated bodies, resembling ovarian tissue, are frequently seen near the ovaries; these are detached tubes of the parovarium, small myomata of the ovarian ligament, or stalked corpora fibrosa. The clinical significance of supernumerary ovaries is in the continuation of the menstrual and childbearing functions after the removal of both ovaries. The diagnosis can only be made by direct inspection.

Congenital Largeness of One or both Ovaries.—This anomaly is occasionally found associated with precocious development of the sexual organs. Hypertrophy of the ovary is more often an acquired lesion. It is physiological during pregnancy and is commonly associated with uterine fibroids. It must be remembered that the normal ovary varies in size within wide limits.

CHAPTER XVI

MALPOSITIONS OF THE GENITAL ORGANS

Malpositions of the Vaginal Walls
- Normal Position
- Cystocele
- Rectocele
- Vaginal Hernia

Malpositions of the Uterus
- Normal Position
- Pathological Mobility
- Pathological Fixation
- Anteposition
- Retroposition
- Lateroposition
- Elevatio Uteri
- Torsion
- Prolapsus Uteri
- Prolapse of Pregnant Uterus
- Inversion
- Anteversion
- Anteflexion
- Retroversioflexion
- Hernia

Malpositions of the Fallopian Tubes
- Normal Position
- Changes in Position

Malpositions of the Ovaries
- Normal Position and Histology
- Changes in Position
- Descensus Ovarii

Hernia of Tube and Ovary

MALPOSITIONS OF THE VAGINAL WALLS

Displacements of the uterus are commonly associated with displacements of the vaginal walls and the appendages of the uterus; hence the advisability of presenting the subject of malpositions of the genital organs in its entirety.

Cystocele.—Synonyms.—Relaxation or prolapse of the anterior wall of the vagina; prolapse of the bladder; vesicovaginal hernia.

Etiology.—1. Relaxation of the anterior and posterior segment of the pelvic floor, due to labor.

2. Lacerations of the anterior and posterior segment of the pelvic floor, due to labor.

3. Prolapse of the uterus.

4. General malnutrition with loss of muscular tone.

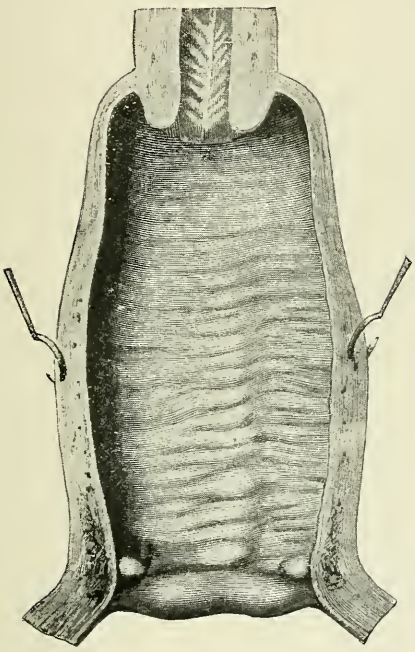
5. Violent muscular exertion.

Cystocele is occasionally observed in women and girls who have not borne children, and may be caused by a lack of muscular tone and by violent muscular exertion. In many instances, childbearing, with the resultant stretching and tearing of the anterior and posterior segments of the pelvic floor, is the underlying cause for the development of cystocele. The lesion is very common, and its clinical importance has been greatly underrated.

Anatomy.—The bladder, which is firmly adhered to the anterior wall of the vagina, will inevitably descend with the vagina. This gives

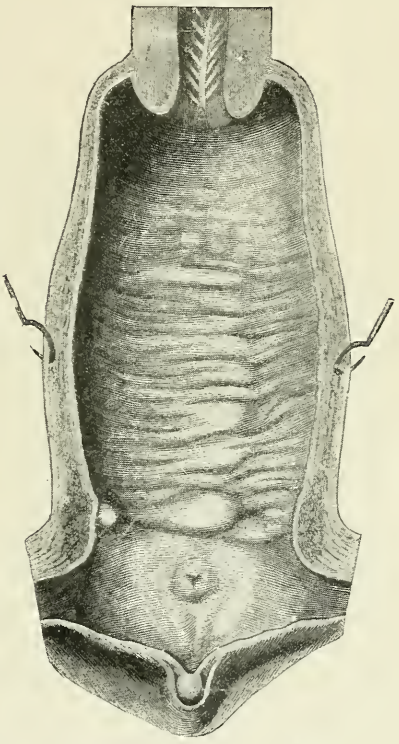
rise to a pouch formed by the posterior wall of the bladder above and the anterior wall of the vagina below. In the early development of a cystocele the walls of the bladder and vagina, which constitute the cystocele, undergo hypertrophy, but as the cystocele enlarges, these walls become stretched and blanched. The vaginal walls become dry and glistening. In extreme cases decubitus ulcers develop upon the vaginal surface. The ureters, as they pass into the bladder, may become so displaced as to lead to constriction, with subsequent dilatation; this, however, is rare.

FIG. 170.



Longitudinal section of the vagina. Segment showing posterior wall. (Testut.)

FIG. 171.



Segment showing anterior wall.

Symptoms.—A small cystocele presents no symptoms. It is only when the relaxation is great that symptoms arise. The symptoms common to cystocele are a sense of fulness at the vulvovaginal orifice, a feeling of heaviness and dragging in the pelvis, and loss of power in urinating.

Sense of Fulness at the Vulvovaginal Orifice.—The patient expresses the belief that her "womb comes down" when she stands, and particularly when she exerts herself at stool or in lifting. Here the increase

in the intra-abdominal pressure forces the pelvic structures downward and exaggerates the cystocele.

Feeling of Heaviness and Dragging in the Pelvis.—This feeling is contributed to more by the prolapsed uterus than by the cystocele. Relief comes from lying down.

Loss of Power in Urinating.—Residual urine accumulates in the vesical pouch, and the dislocated bladder is placed at a disadvantage in emptying itself because of the faulty contractions of the bladder and the inability of the intra-abdominal pressure to exert a direct influence upon the bladder. As a result the patient is compelled to

FIG. 172

Vulva of non-parous woman closed. (Jewett.)

make undue exertion in urinating, and believes that she has lost the power to void urine. She acquires the habit of making pressure with the index finger upon the cystocele as an aid to voiding. Decomposition of the residual urine leads to irritability of the base of the bladder, and this, in turn, to frequency of urination, with more or less discomfort.

Differential Diagnosis.—Cystocele is to be differentiated from cysts and fibroids of the anterior wall of the vagina and from hernia of the anterior vaginal wall. A sound placed in the bladder and the index

finger of the left hand placed in the vagina will serve to differentiate a cystocele from these conditions.

Prognosis.—Unless corrected by operative means the tendency is toward exaggeration of the dislocation. Without operation there is no cure. The operative prognosis is at best uncertain. If the patient is young and the muscular development is good, operation will usually effect a complete cure so far as the symptoms are concerned, but there will commonly be found some degree of pouching afterward. When the pelvic supports are poorly developed, and there is much stretching of the parts, it is difficult to obtain a perfect result. In such cases the operator must be satisfied to obtain a degree of improvement.

Fig. 173

Vulva of non-parous woman open, hymen intact. (Jewett.)

Treatment.—The treatment is prophylactic, palliative, and operative.

Prophylactic Treatment.—To prevent the development of a cystocele it is essential that the general nutrition of the patient should be kept at a normal standard. This implies due regard for all hygienic principles. The diet and exercise must be regulated to suit the individual

case. The dress should be so arranged that all undue constriction and traction about the waist line is eliminated. The bowels should be regulated so as to avoid straining at stool, and such duties as call for great exertion should be avoided so far as possible. These precautionary measures are of importance following childbirth, in order that the pelvic tissues may resume their normal tone and position.

Fig. 174

Vulva of parous woman closed. (Jewett.)

The early correction of injuries to the pelvic floor is imperative, inasmuch as the starting-point of a cystocele is usually a lacerated perineum. The speedy and complete involution of the uterus following childbirth is necessary. This implies the prevention of infection, directing the posture of the patient to avoid the development of displacements, and, when there is great relaxation of the abdominal walls, the adjustment of a properly fitting abdominal support. Finally, the correction of a displacement of the uterus by the introduction of a suitable pessary or by operation will often avert the development of a cystocele.

Palliative Treatment.—Not every cystocele should be operated upon, and not every operation is successful, hence the necessity of palliative measures for the relief of distressing symptoms. The following measures are to be employed:

Abdominal Support.—When the abdominal wall is relaxed and pendulous a suitable abdominal supporter should be worn to reduce the intra-abdominal pressure. Tight-lacing and clothing that constrict the waist should be avoided.

Fig. 175

Vulva of parous woman open. (Jewett.)

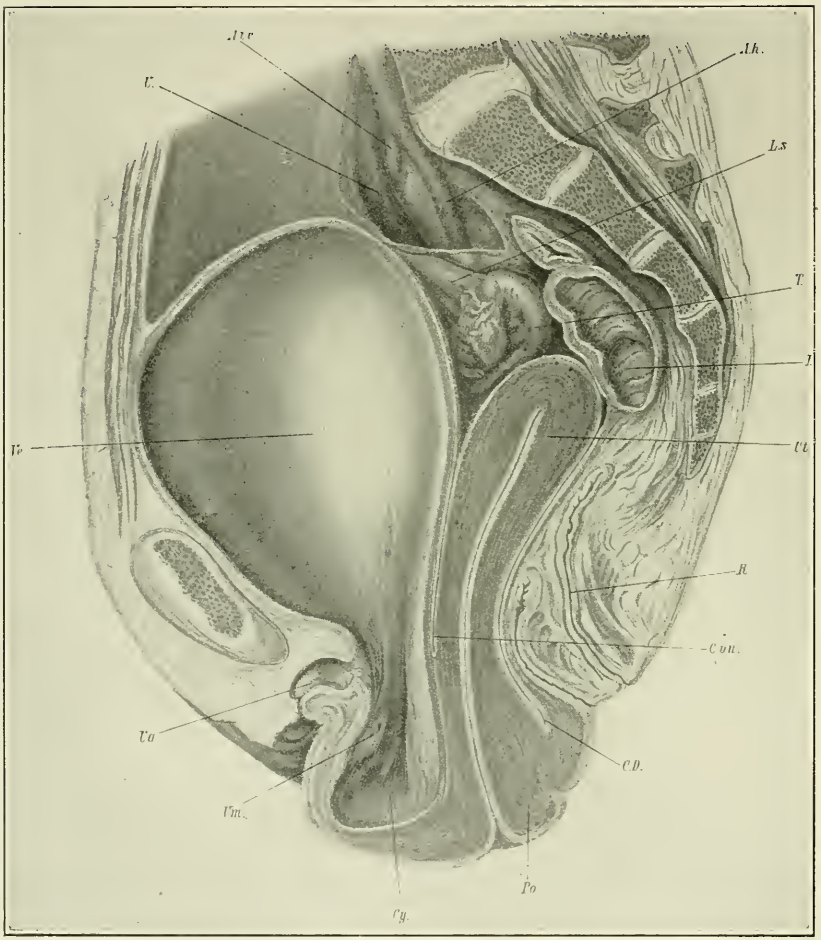
Vaginal Tampons.—Vaginal tampons of lambs' wool may be worn as a support to the sagging vaginal walls. These should be removed when fouled by the secretions in the vagina.

Vaginal Douches.—Astringent vaginal douches of hot water, with alum, zinc, or tannin, may be given night and morning. These will keep the vagina free of irritating secretions, and will also have a puckering effect upon the walls of the vagina.

Pessaries.—The only effective pessary for the support of a cystocele is Skene's. The method of introduction is the same as for an Albert-Smith pessary. (See chapter on Pessaries.)

Operative Treatment.—Anterior Colporrhaphy.—The first step in the development of a prolapsed uterus is, as a rule, the relaxation and sagging of the anterior wall of the vagina. Too frequently this

Fig. 176

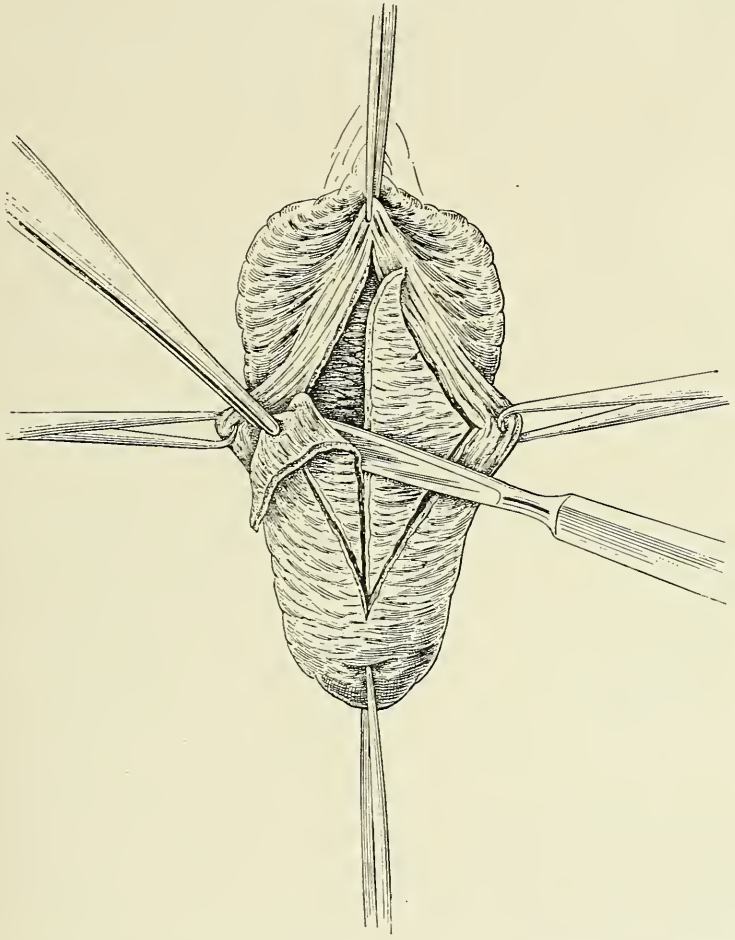


Topography of bladder and ureters in cystocele as shown by sagittal section: *A.h.*, hypogastric artery; *A.i.e.*, external iliac artery; *C.d.*, Douglas' pouch; *C.v.u.*, vesico-uterine pouch; *Cy.*, cystocele; *L.s.*, infundibulopelvic ligament; *Po.*, portio vaginalis; *R.*, rectum; *T.*, Fallopian tube; *U.*, ureter; *Ua.*, urethra; *Um.*, ureteral orifice; *Ut.*, uterus; *Ve.*, bladder. (Tandler and Halban.)

fact is not appreciated, and hence the prolapsus is allowed to develop. The sagging of the anterior wall of the vagina proceeds from a point near the urethra upward to or near the cervical attachment; rarely does the sagging proceed from above downward.

Technic of Anterior Colporrhaphy.—This operation was introduced by Marion Sims. Fricke, Hegar, Winckel, Martin, Emmet, Küstner, Fehling, and others have made various modifications in the technic.

Fig. 177

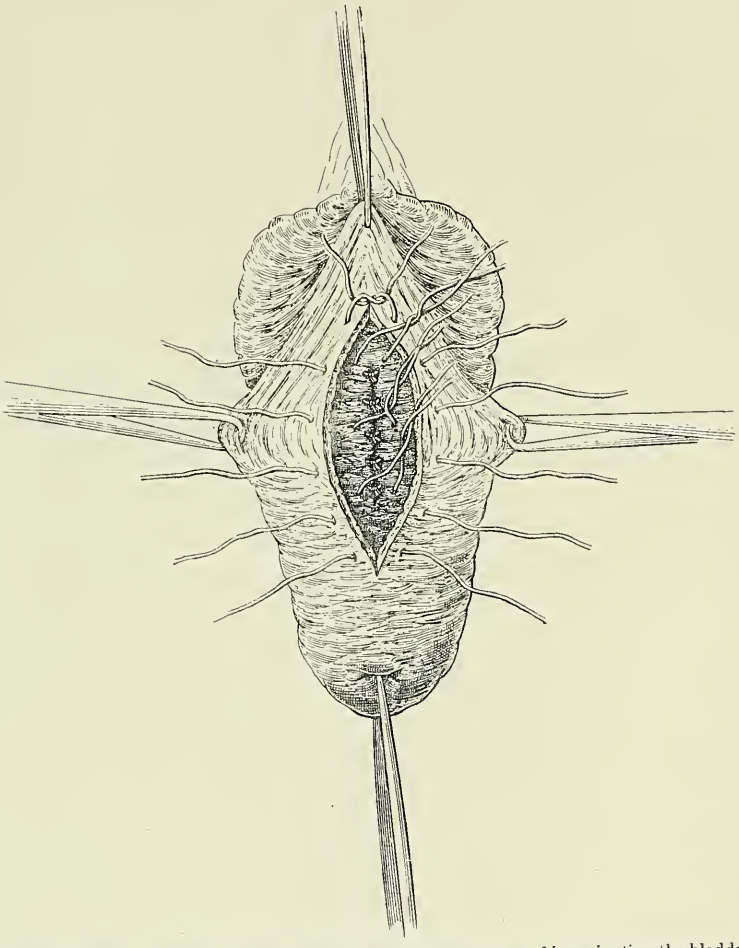


Diamond-shaped area outlined. Flap of vaginal mucous membrane dissected from the bladder. Step one.

Four two-pronged tenacula are required: one grasps the anterior lip of the cervix and by it traction is made downward; a second grasps the vaginal wall at a point immediately below the external urethral orifice and with it gentle traction is made upward; the other two are placed one on either side of the cystocele, at the midpoint, and with them gentle traction is made outward. In this manner the cystocele is so stretched as to form a diamond-shaped area, which is readily accessible to the operator.

The area of denudation is then outlined, with a sharp knife, beginning at the upper angle and extending on either side to the outer angles and thence to the lower angle. The incision should not extend deeper than the vaginal mucosa. It will facilitate the process of denudation to make a straight incision joining the upper and lower angles, thereby bisecting the flaps to be denuded.

Fig. 178



Row of buried plain catgut placed in bladder wall for the purpose of invaginating the bladder. Second step.

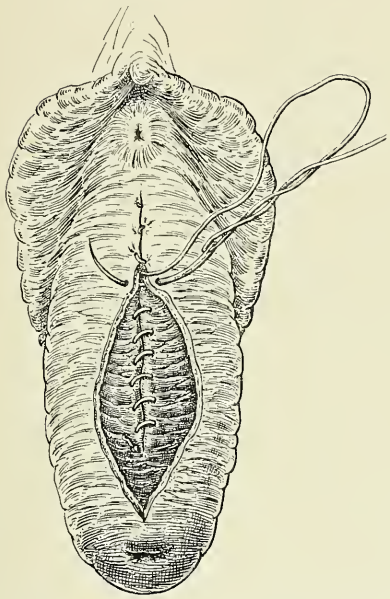
With scalpel and tissue forceps the mucous membrane is denuded as shown in Fig. 177, and exposes a raw surface as shown in Fig. 178.

The next step is to unite the lateral margins of the denuded area, crowding the bladder backward, thereby disposing of the cystocele. To do this a No. 2 ten-day chromic catgut suture is passed in an over-

and-over lock stitch from the upper to the lower angle, or interrupted sutures are passed as shown in Fig. 180.

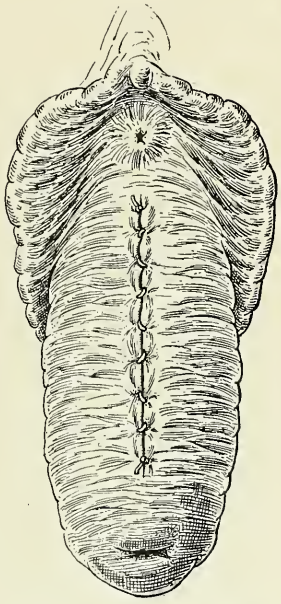
When an extensive area is denuded, additional buried stitches may be required to approximate the deeper structures. This is done by making a running stitch in one or more layers with No. 2 plain catgut, and over this the vaginal mucosa is approximated with ten-day chromic catgut. Care must be taken to avoid injury to the bladder and ureters and to leave no dead spaces.

Fig. 179



Running suture of chronic catgut approximating the free margins of the vaginal wall. Third step.

Fig. 180



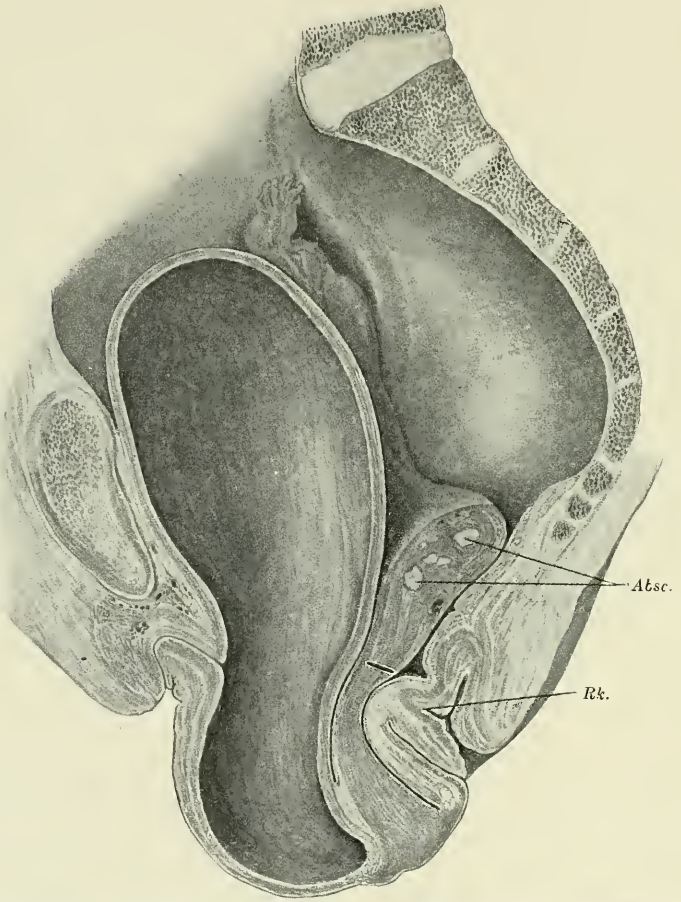
Operation complete. Fourth step.

Noble's Operation.—Charles P. Noble[1] has devised an admirable operation for the correction of cystocele. After curetting the uterus and amputating the cervix when necessary, traction is made downward upon the cervix by means of a vulsellum forceps. Counter-traction is made upward upon the anterior wall of the vagina by means of a bullet forceps inserted immediately below the external orifice of the urethra. In this manner the anterior wall of the vagina is put upon the stretch. A narrow strip of vaginal wall is excised between these two forceps. Artery forceps are made to grasp the sides of the vaginal opening, and outward traction is made upon them while the bladder is stripped from the cervix upward to the peritoneal reflexion and laterally from the vaginal walls to an extent that will permit of the ascent of the prolapsed bladder into the peritoneal cavity. The redundant vaginal tissue is next excised, taking care that too much tissue is not removed.

[1] Jour. Amer. Med. Assoc., December 14, 1907.

The area excised is usually oval, with the base toward the cervix. Two rows of continuous sutures are now placed. At the upper extremity the sutures embrace the deeper layers of the vagina and base of the bladder, and below this point the deeper layers of the vagina are sutured to the anterior wall of the cervix. This line of sutures is followed by

FIG. 181



Retroflexion of uterus, with partial prolapse of uterus and elongation of cervix. Abscess in wall of uterus. (Tandler and Halban.)

a second continuous suture, which approximates the free margins of the vaginal wall. When there is much tension on the continuous sutures it is advisable to pass two or more interrupted sutures of chromicized catgut through vaginal walls and cervix.

AMPUTATION OF THE CERVIX.—When the cervix is elongated or badly lacerated it should be amputated as the next step, following anterior colporrhaphy. For the technic of the operation see page 294.

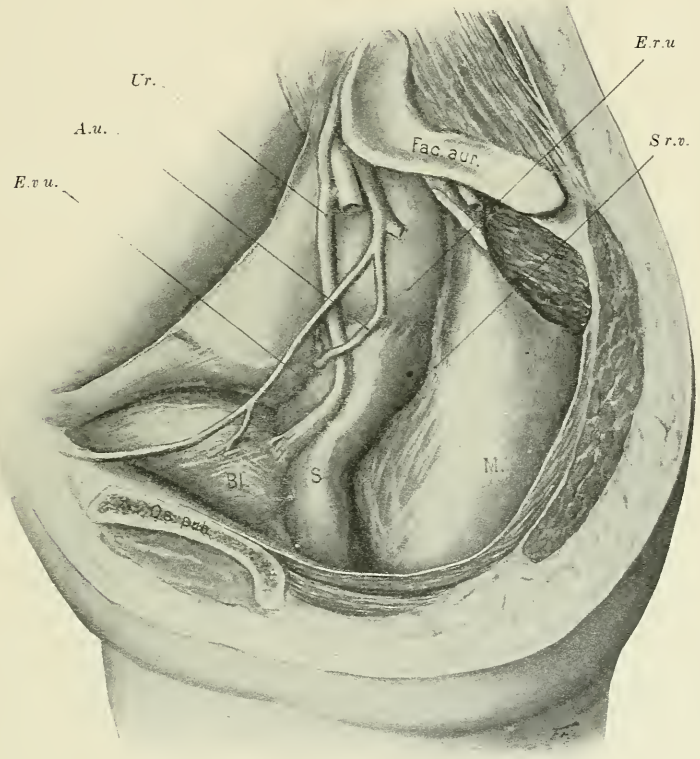
After Treatment.—See Perineorrhaphy.

Rectocele.—Synonyms.—Prolapse of the posterior wall of the vagina; rectovaginal hernia.

Etiology.—1. Relaxation of the vaginal walls and pelvic floor following labor.

2. Lacerations of the vaginal walls and pelvic floor following labor.
3. Prolapsus uteri.
4. General malnutrition, with loss of muscular tone.
5. Violent muscular exertion.

FIG. 182



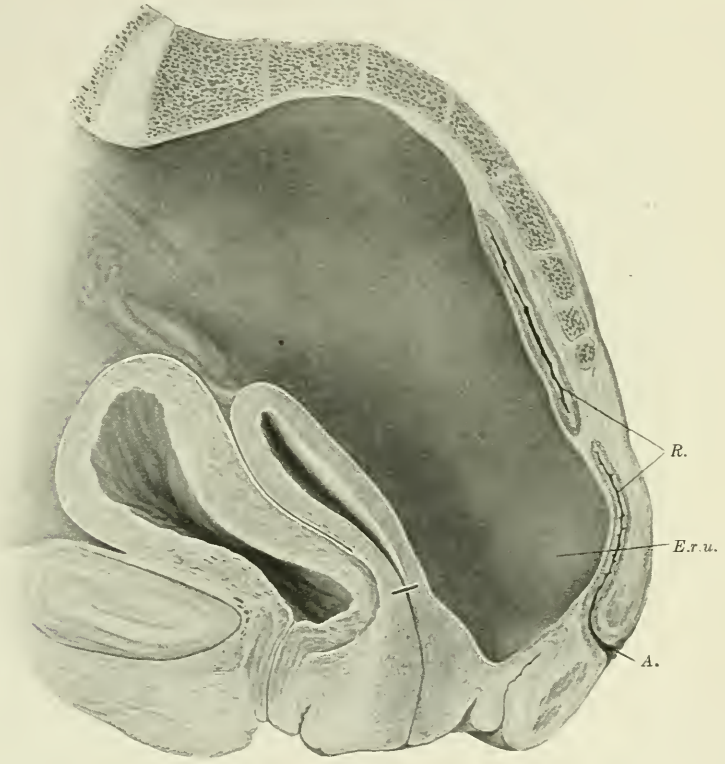
Anterior wall of the rectum bulges into the vagina (rectocele). *M.*, rectum; *S.*, vagina; *Bl.*, bladder; *E.v.u.*, vesico-uterine pouch; *E.r.u.*, cul-de-sac of Douglas; *S.r.v.*, rectovaginal septum; *A.u.*, uterine artery; *Ur.*, ureter.

Anatomy.—The pelvic floor is an essential factor in the support of the pelvic organs, and when overstretched or torn, there is a tendency on the part of the uterus, bladder, rectum, and vaginal walls to prolapse. It is in this manner that the majority of rectoceles arise. While it is possible for the posterior wall of the vagina to prolapse without

carrying with it the anterior wall of the rectum, it may be said that it is exceptional, the rule being that the anterior wall of the rectum is carried forward with the posterior wall of the vagina.

In the early development of a rectocele the vaginal wall is thickened and thrown into folds, but with increase in size of the rectocele the vaginal wall looses its folds and becomes thin and glistening. These changes are particularly marked in women of advanced age. When the pouching walls have protruded from the vulva the mucosa becomes leathery and ulcers may develop; the rectal mucosa may become inflamed and ulcerated, and hemorrhoids, fissures, and fistulæ may arise

FIG. 183



Almost complete prolapse of the anterior vaginal walls and posterior vaginal wall Elongation of the cervix. Partial prolapse of the uterus. Anteflexio-versio-uteri. Cystocele. Hernia of the cul-de-sac. *R*, rectum; *E.r.u.*, cul-de-sac; *A*, hernia. (Tandler and Halban.)

Symptoms.—No symptoms arise from a small rectocele. When well-developed the following symptoms are complained of:

1. Feeling of fulness at the vulvovaginal orifice.
2. Feeling of heaviness and dragging in the pelvis.
3. Loss of power in defecation.

Feeling of Fulness at the Vulvovaginal Orifice.—The patient will usually say that her "womb comes down" when she stands or when at stool; the feeling of fulness at the vulvovaginal orifice is due to the bulging rectocele and accompanying cystocele.

Feeling of Heaviness and Dragging in the Pelvis.—The feeling of heaviness and dragging in the pelvis is due to the prolapse of the pelvic organs associated with the rectocele.

Fig. 184

Rectocele. The index finger in the rectum finds its way into the rectal pouch which protrudes into the vagina.

Loss of Power in Defecation.—Under normal conditions in the act of defecation the perineum is elevated, the vaginal canal is closed, the contraction of the levator ani assists the sphincter in dilating, and the deep pelvic fascia further supports the rectum. It will be seen that the anterior wall of the rectum, under normal conditions, is well supported, but with the pelvic floor stretched or torn these supports are weakened, and, as a result, an undue strain is placed upon the anterior wall of the rectum and posterior wall of the vagina; this gives rise to a rectocele, and once started it tends to increase in size. Constipation is thereby engendered, and there is a feeling on the part of the patient that she is unable to thoroughly evacuate the rectum.

Diagnosis.—With the patient in the lithotomy position and the vulva exposed she is asked to strain. The rectocele will then appear at the vulvar outlet as a globular mass, which is readily reduced by pressure with the finger. The index finger inserted into the rectum will identify beyond question the rectocele.

Treatment.—The only way to correcting a rectocele is by means of a a plastic operation. Without operation the tendency is to increase in size.

Prophylaxis.—See Prophylaxis under Vesicocele, page 291.

Palliative Treatment.—When operative interference is impossible and the symptoms are distressing, some degree of relief may be obtained by the following procedures:

Lessening of the Intra-abdominal Pressure.—This can be accomplished by removing all traction and constriction of the waist through faulty clothing, by relieving constipation to obviate straining at stool, and finally by adjusting a suitable abdominal support when the abdomen is pendulous.

Vaginal Douches.—Vaginal douches of hot sterile water and alum, zinc, or tannin will tend to shrink the tissues.

Tampons.—Tampons of lambs' wool will serve as a temporary support.

Pessaries.—Pessaries are not always successful. A large cystocele and rectocele, with a gaping vulvar outlet, will not permit of the wearing of any sort of pessary unless it be a cup and stem pessary attached to an abdominal band.

Less pronounced relaxation of the pelvic floor and vaginal walls may permit the wearing of a ring pessary.

Operative Treatment.—See Perineorrhaphy.

Vaginal Hernia.—Etiology.—Vaginal hernias are thought by some to be due to a congenital maldevelopment of the pelvic peritoneum and pelvic organs.

So far as the author's knowledge goes the lesion is acquired through labor, in which the pelvic floor is stretched and torn.

As compared with rectocele and cystocele, vaginal hernia is a rare condition. The more common of the two is posterior vaginal hernia.

Anatomy.—One or more loops of small bowel find their way either in front or behind the broad ligaments; the former to produce an anterior vaginal hernia, the latter a posterior vaginal hernia.

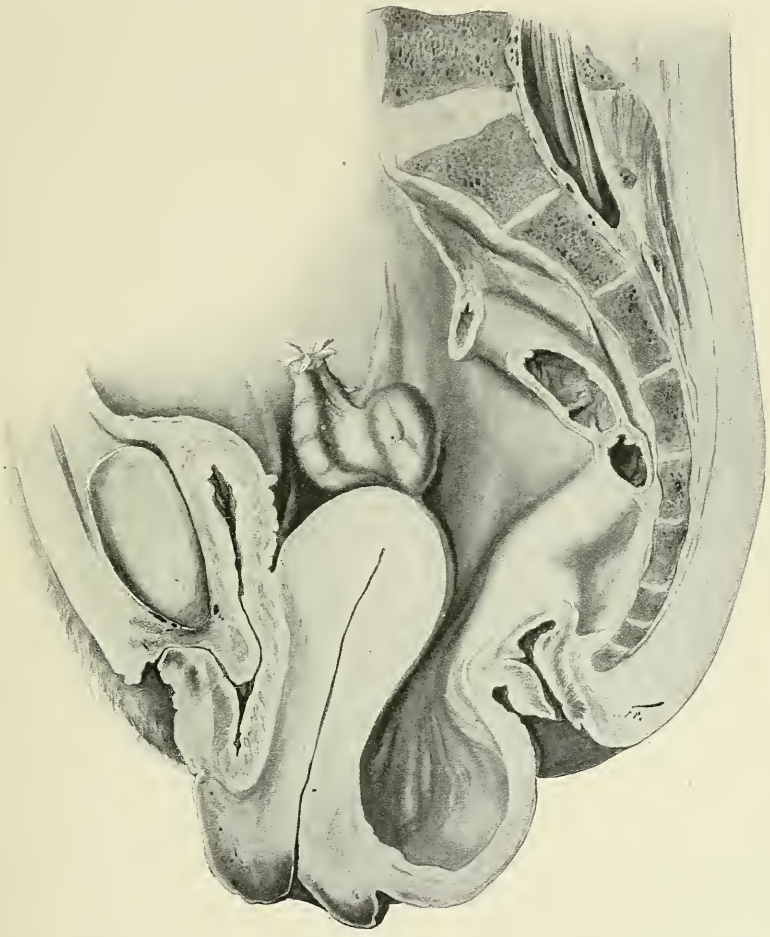
An anterior vaginal hernia starts in the vesico-uterine pouch of peritoneum; this peritoneal fold is forced downward between the bladder and vagina, and may enter the labium majus in its posterior third.

A posterior vaginal hernia starts in the cul-de-sac and descends between the rectum and vagina, separates the muscular fibers of the levator ani, and finally appears in the perineal body or in the posterior segment of the labium majus.

Symptoms.—The clinical manifestations of vaginal hernia do not differ from those found in a cystocele or rectocele, there being a sense of fulness in the vagina, vulva, or perineum and a feeling of weight and dragging in the pelvis. There should be no disturbance of urination or defecation.

Diagnosis.—Care must be taken not to mistake a vaginal hernia for a cystocele, rectocele, tumor of the vagina, Bartholinean cyst, or inguinal hernia that has descended into the labium majus.

Fig. 185



Partial prolapse of the uterus. Moderate elongation of the cervix. Hernia of the cul-de-sac of Douglas. Beginning cystocele.

A vaginal hernia is distinguished from these lesions by its soft consistency, by becoming tense on coughing, by being reduced on pressure, and by causing a gurgling sound on reduction. Finally, by inserting a finger within the rectum and another within the vagina the presence of an intervening body between the vaginal wall and rectal wall is disclosed. A sound placed in the bladder and the index finger in the vagina will reveal a similar condition in the presence of an anterior vaginal hernia.

All Bartholinean cysts and vaginal tumors are readily distinguished from vaginal hernias by not disappearing on pressure and by their sharply circumscribed character.

An inguinal hernia when reduced will follow the course of the inguinal canal and is in this way distinguished from a vaginal hernia.

Treatment.—1. Evacuate the bladder and rectum.

2. Place the patient in the knee-elbow position.

3. Reduce the hernia by gentle manipulations.

4. Prevent recurrence by introducing a hard-rubber ring pessary.

5. Radical cure: The only satisfactory manner of dealing with this condition is by operation. Pessaries will, at best, afford only temporary relief.

FIG. 186

Rectovaginal hernia. Pouch of peritoneum is caught with a forceps and twisted into a rope. First step. (After Ashton.)

POSTERIOR VAGINAL HERNIA.—Posterior vaginal hernia is operated in the following steps:

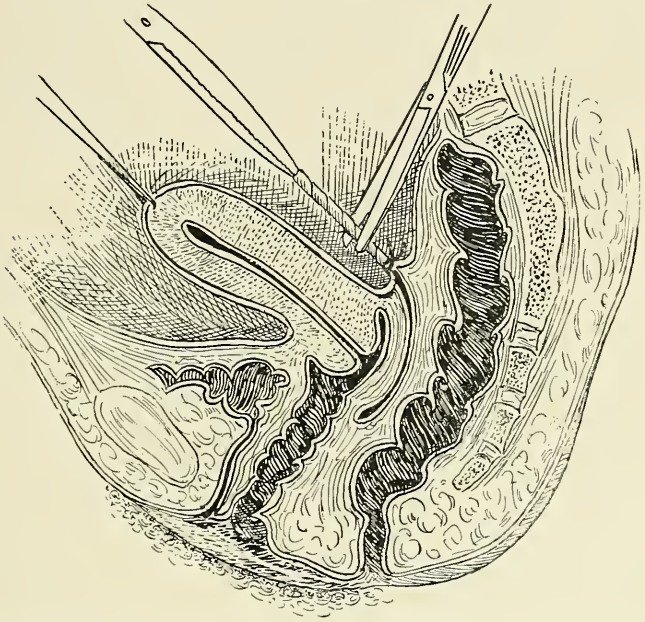
1. Abdominal incision and correction of any existing uterine displacement.

2. After separating any existing adhesions the cul-de-sac is seized with forceps and twisted upon itself to form a tight cord. The cord is then transfixed at its base by a ligature of linen, which is tied and the cord severed above the ligature. This obliterates the hernial sac. If the sac cannot be pulled out of its advanced position the space should be obliterated to the normal level of the cul-de-sac by interrupted catgut sutures.

3. Plastic operations are performed upon the anterior and posterior vaginal walls and perineum when indicated.

Anterior Vaginal Hernia.—The operative steps do not differ essentially from those taken in posterior vaginal hernia.

Fig. 187



Retrovaginal hernia. A rope of peritoneum is ligated at its base with linen and severed above the ligature. Second step. (After Ashton.)

MALPOSITIONS OF THE UTERUS

Normal Position.—Under perfectly physiological conditions the uterus may occupy widely varying positions. In order that these physiological changes in position may occur, the uterine ligaments, pelvic peritoneum, and cellular tissue must possess their normal degree of elasticity (Fig. 192).

The normal position of the uterus varies with the attitude of the individual. It is crowded backward by a full bladder, forward by a loaded rectum, and forward and downward by increase in the intra-abdominal pressure from coughing, straining at stool, etc.

By reference to Figs. 194 and 195, it will be seen that the normal position of the uterus of a virgin in the erect posture, with the bladder and rectum empty, is one of anteversion, slight anteflexion, anteposition, and slight lateral position. The body of the uterus lies about 1 cm.

behind the upper border of the symphysis pubis, the cervix points to the second sacral vertebra, and lies about 2 cm. in front of the sacro-

Fig. 188

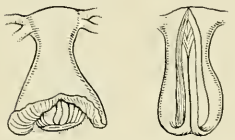


Fig. 189

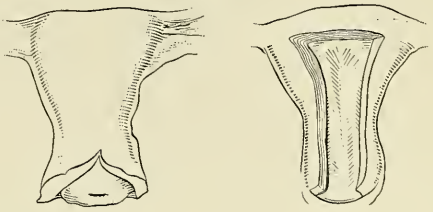


Fig. 190

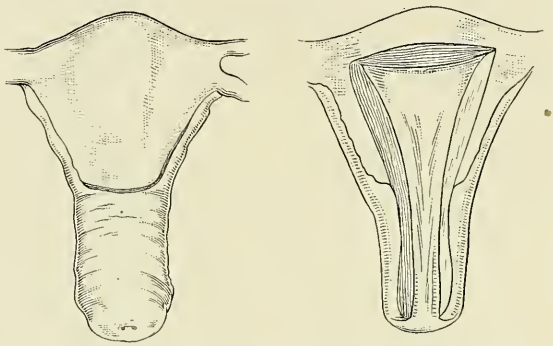
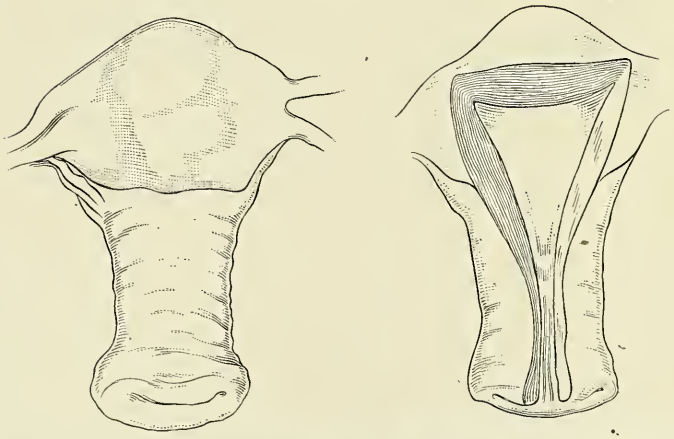


Fig. 191

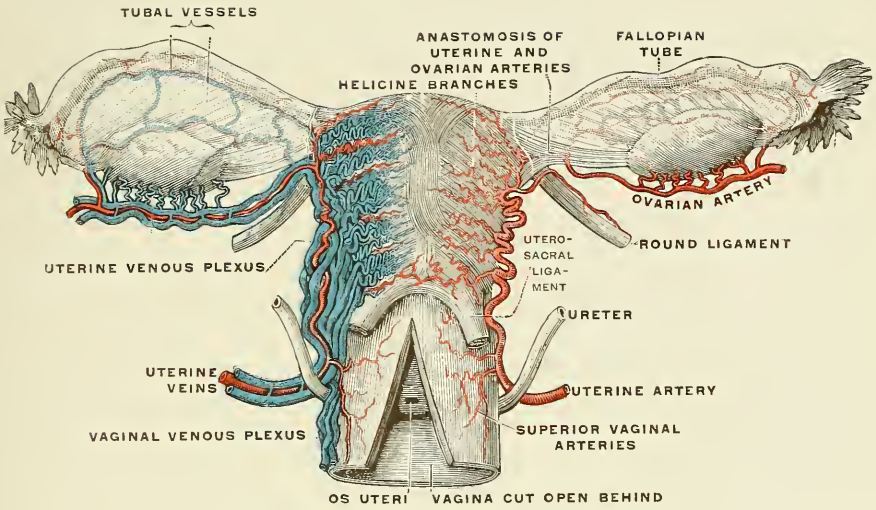


Figs. 188 to 191.—Uterus at varying periods of life. Fig. 188, uterus of newborn child; Fig. 189, uterus at puberty; Fig. 190, nulliparous uterus fully developed; Fig. 191, multiparous uterus. (Modified from Chrobak and Rosthorn.)

coccygeal articulation. In the virgin there is less anteflexion than in a multipara. The explanation lies in the fact that the small resisting vagina presses the slender cervix backward (Figs. 193 and 194).

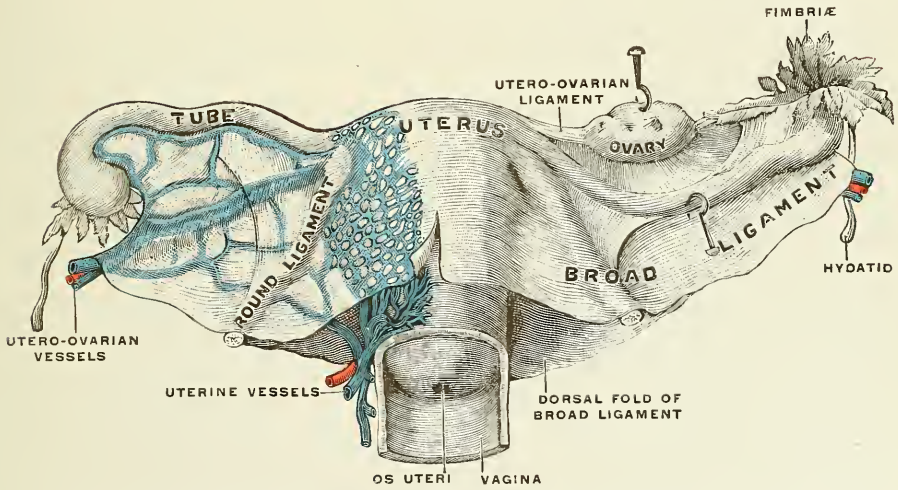
PLATE XVI

Fig. 1



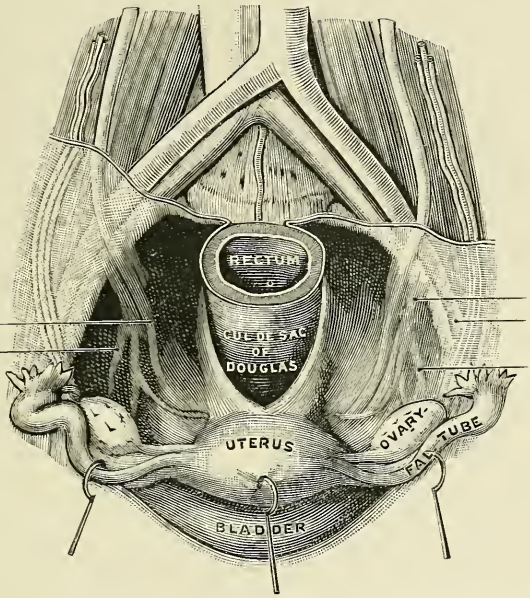
Bloodvessels of the Uterus and its Appendages. (Testut.)

Fig. 2



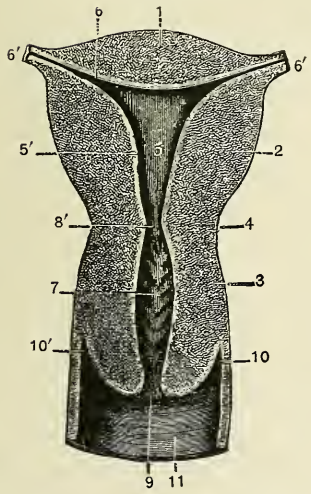
The Uterus and Adnexa Viewed from in Front. (Testut.)

Fig. 192



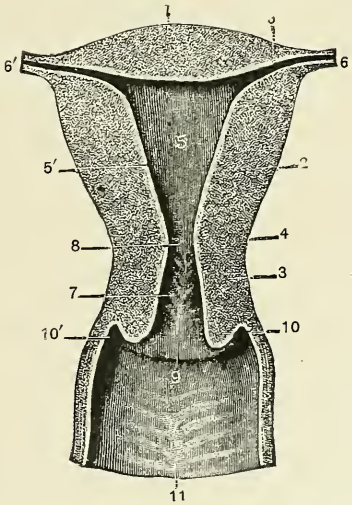
The uterosacral ligaments or folds of Douglas. (Testut.)

Fig. 193



Coronal section of the uterus of a nulliparous woman.

Fig. 194



Coronal section of the uterus of a multiparous woman.

1, fundus; 2, lateral walls of the body; 3, cervix; 4, isthmus; 5, cavity of the body; 5′, internal wall of the body; 6, cornu; 6′, opening of the Fallopian tube; 7, arbor vitæ; 8, os internum; 9, os externum; 10, 10′, lateral fornices; 11, posterior vaginal wall. (Testut.)

Pathological changes in the position of the uterus and its neighboring organs are more or less permanent. There is no tendency toward a spontaneous return to the normal position.

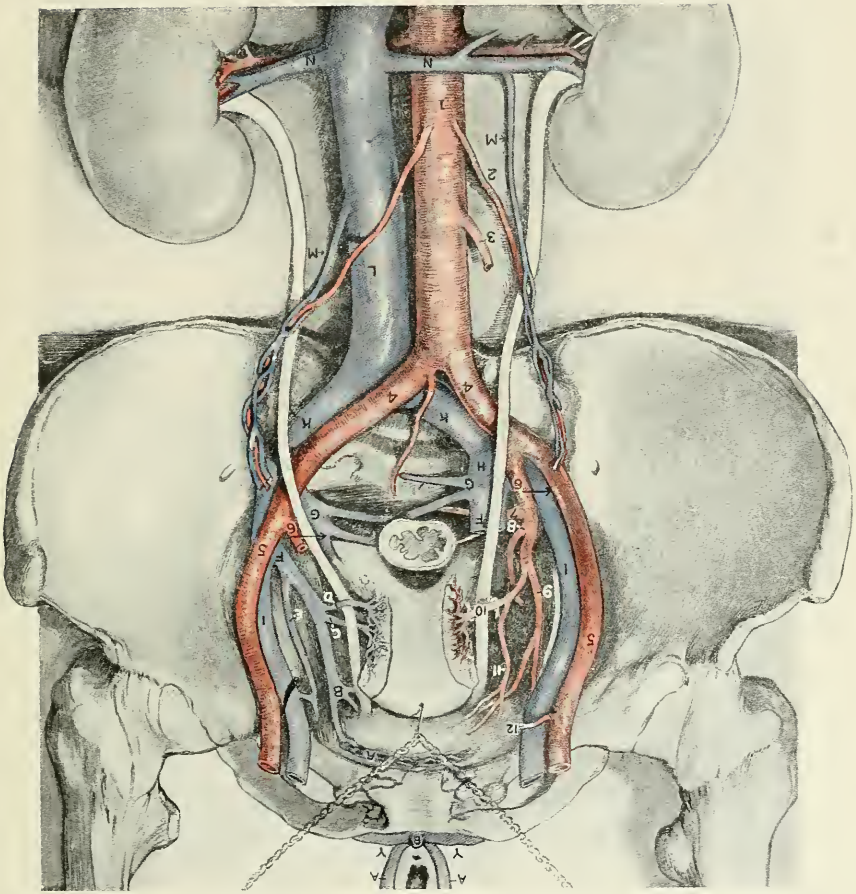
Fig. 195

Normal position of the uterus. The uterus lies anteposed, anteverted, and slightly anteflexed when the bladder and rectum are empty and the patient in the upright position.

Pathological Mobility.—The uterus becomes abnormally movable when the normal supports are weakened or have given way. A relaxation of the uterine ligaments, of the pelvic floor and of the abdominal muscles will lead to abnormal mobility of the uterus. Under such conditions the uterus gravitates according to the position of the patient. In the upright posture, with the bladder empty, it may fall forward and downward. In the dorsal posture with the rectum empty, the uterus falls backward into the hollow of the sacrum. This condition, when uncomplicated, cannot be regarded seriously from a clinical point of view.

Pathological Fixation.—An abnormally movable uterus may lodge in a position where it becomes fixed and immovable. It is thereby evident that the factors causing increased mobility of the organ may lead to a more or less permanent fixation. Fixation of a misplaced uterus will be considered in subsequent chapters. We will here discuss only fixation of the normally placed uterus. By this is meant a uterus

PLATE XVII



Bloodvessels of the Abdomen and Pelvis. (Leipmann.)

1. Aorta.
2. Ovarian artery.
3. Inferior mesenteric artery.
4. Common iliac artery.
5. External iliac artery.
6. Internal iliac artery.
7. Inferior gluteal artery.
8. Common pudendal artery.
9. Obturator artery.
10. Uterine artery.
11. Superior vesical artery.
12. Inferior epigastric artery.

A. Pudendal plexus.
B. Vesicovaginal plexus.
C. Inferior uterine vein.
D. Superior uterine vein.
E. Obturator vein.
F. Internal iliac vein.
G. Median iliac vein (hemorrhoidal plexus).
H. Hypogastric vein.
I. External iliac vein.
K. Common iliac vein.
L. Vena cava.
M. Ovarian vein.
N. Renal vein.
A. Bulbus vestibuli.
B. Corpus clitoris.
C. Crus clitoris.

in normal position, but lacking the degree of elasticity and mobility that is found in health.

Parametritis atrophicans (Freund), or parametritis posterior (Schultze), is a condition frequently overlooked. The uterosacral ligaments are firmly contracted and tender. By thickening and contraction of the uterosacral ligaments the cervix is drawn backward and the whole uterus restricted in its movements. A chronic metritis will diminish the normal flexibility of the uterus, as may also carcinoma and fibroids. Chronic cervical catarrh may stiffen the cervix.

Fig. 196

Anteposition. The loaded rectum crowds the uterus forward into anteposition when the bladder is empty. The cul-de-sac of Douglas is almost obliterated. When the rectum is empty the uterus will fall back into the normal position.

Anteposition.—Anteposition is an exaggerated normal position; the uterus lies immediately behind the abdominal wall and symphysis pubis. Among the causes of anteposition of the uterus are swellings behind crowding the uterus forward, or adhesions attached to the anterior surface of the uterus pulling it forward, such as are made by ventrofixation. The latter condition is very unusual. The most common causes are tubal and ovarian swellings lying in the cul-de-sac of Douglas, retro-uterine hematocele, tumors of the uterus bulging from the posterior surface of the uterus, and newgrowths of the

rectum. Anteposition is often combined with elevation, anteversion, and anteflexion.

The diagnosis is seldom difficult. On bimanual examination the uterus is found lying close to the anterior abdominal wall. When caused by retro-uterine swellings, which cannot be outlined apart from the uterus, the sound will be required to locate the position of the organ. A retro-uterine tumor, crowding the uterus, forward, is recognized by its irregular outline and its consistency. Here, again, the uterine sound will be of service in locating the uterus. In every doubtful case an anesthetic should be administered. The one symptom, commonly present, is frequent urination. (See Plate XVIII and Fig. 196.) Anteposition of the uterus is but an exaggerated normal position, and is not to be regarded seriously. The determining factors and associated lesions, as above named, alone demand serious consideration.

Retroposition.—In retroposition the uterus lies back of the normal position without change in the direction of its long axis. The causes of retroposition are swellings in front of the uterus or adhesions behind it. Among swellings in front of the uterus are uterine fibroids, tumors of the bladder and anterior abdominal wall, persistent distention of the bladder, and, occasionally, enlarged tubes and ovaries. Adhesions behind the uterus causing retroposition are largely confined to the peritoneal cavity, and involve more or less of the posterior surface of the uterus. These adhesions most frequently result from extension of an inflammation from the tubes which, when inflamed, commonly lie behind the uterus. In abnormal mobility of the uterus, due to a relaxation of the normal supports, the uterus falls into retroposition when the patient lies upon her back.

It is important to recognize the cause of the displacement, inasmuch as retroposition *per se* is of little clinical significance. When no tumor mass or adhesions are found in the pelvis and the retroposed uterus displays an abnormal mobility, the displacement is regarded as due to relaxation of the uterine supports.

It is not always possible to diagnosticate the presence of adhesions, even when the examination is made under anesthesia. Experienced operators will testify to the frequency with which perimetritic adhesions are unexpectedly found after opening the abdominal cavity. This fact alone would seem to render the Alexander operation of shortening the round ligaments through the inguinal canal an uncertain procedure.

Perimetritic adhesions are confined to surfaces normally covered with peritoneum. They are found with the greatest frequency about inflamed tubes and ovaries, and are therefore most commonly located beside or behind the uterus. The uterus is rarely absolutely fixed. The degree of mobility depends upon the location of the adhesions, their extent, length, and firmness. Adhesions binding the uterus to movable structures, such as bowel and omentum, usually permit more or less mobility on the part of the uterus. The diagnosis of a perimetritic exudate—that is, of an exudate lying within the peritoneal cavity and binding together the peritoneal surface of the uterus with the peritoneal

PLATE XVIII

Fig. 1

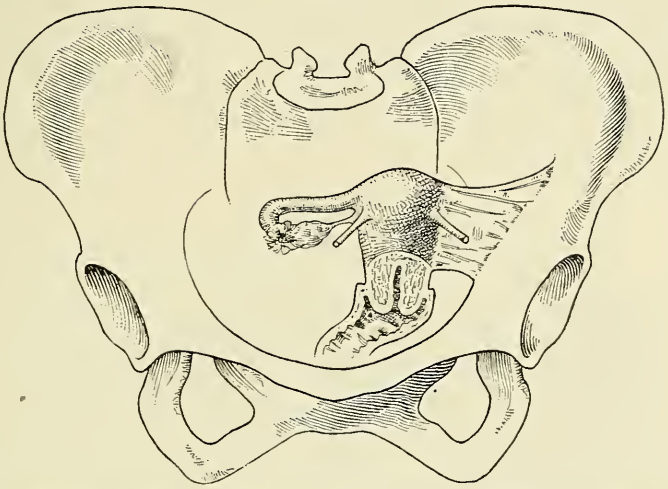
Anteposition of the uterus. A retrouterine hæmatocele fills the cul-de-sac of Douglas and the space between the uterus and sacrum. The uterus is crowded forward.

Fig. 2

Retrouterine Hæmatoma Crowding the Cul-de-sac of Douglas Up and the Uterus Upward and Forward.

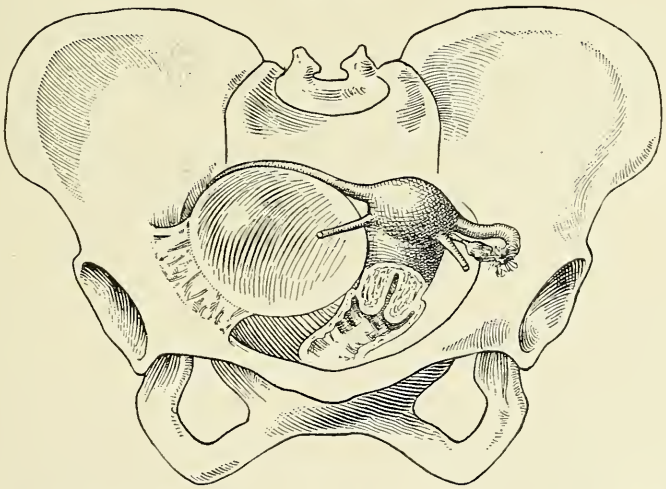
surfaces of adjacent structures, from an exudate involving the pelvic cellular tissue—is made first of all by the location. A parametritic

FIG. 197



Left laterodisplacement of the uterus. The left broad ligament is thickened and contracted and has drawn the uterus to the left.

FIG. 198



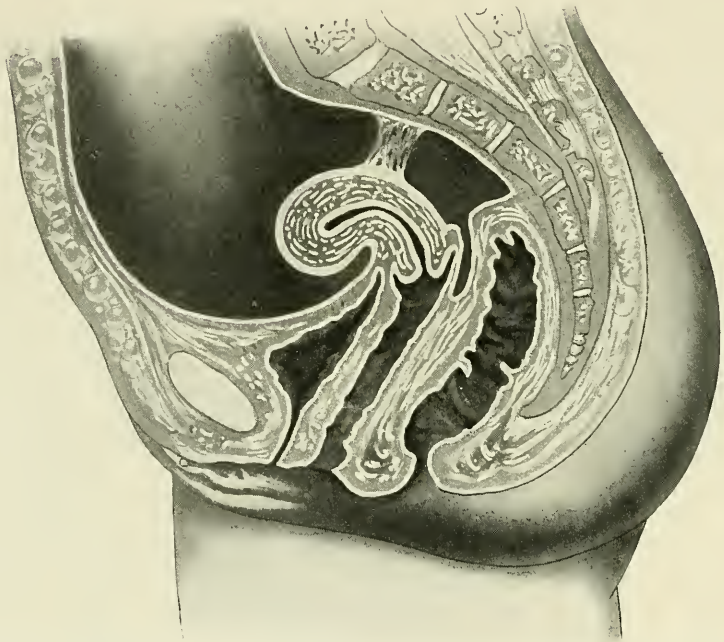
Left lateroversion of the uterus. The uterus is crowded to the left side of the pelvis, the long axis of the uterus inclines to the left. The cause of the displacement is a broad ligament cyst of the right side adherent to the wall of the pelvis.

exudate lies low in the pelvis in close proximity to the vaginal wall, while a perimetritic exudate lies on a higher plane and is more difficult to palpate through the vagina. Furthermore, in parametritis the

adhesive bands are firmer and larger than in perimetritis. The uterine sound may be of service in locating the position of the uterus apart from inflammatory exudates and new formations.

Lateroposition.—Lateroposition of the uterus is generally combined with retroposition, less often with anteposition and descensus. A limited lateral displacement of the uterus may be regarded as normal, and is explained by a shortening of the broad ligament on the side to which the uterus leans. This congenital unilateral shortening of the broad ligament and also of the uterosacral ligament accounts for the lateral displacement of the uterus, not infrequently found in virgins.

Fig. 199



Retroposition of the uterus. The uterus is drawn backward into retroposition by peritoneal bands of adhesions extending from the supravaginal portion of the cervix to the sacrum.

The usual causes of lateral displacements of the uterus are inflammatory exudates and new-formations; more rarely cicatricial contractions of the vaginal wall following lacerations and sloughs. Exudates at the sides of the uterus, when large, will crowd the organ to the opposite side of the pelvis. Later, as the exudate organizes and contracts, the uterus is drawn to the side occupied by the exudate (Fig. 199). If the exudate exerts its influence along the entire side of the uterus, the uterus, as a whole, will be first pushed to the opposite side and later drawn to the same side. If the exudate involves the lower segment of the broad ligament, leaving the body of the uterus free and movable,

the cervix will be drawn toward the side in which the exudate has collected and the body of the uterus is tilted to the opposite side—a lateroversion or lateroflexion. Likewise, in case of tumor formations lying beside the uterus, if the force is distributed along the side of the uterus there will be a simple lateroposition; if pressure is exerted upon the fundus alone, there will be a lateroversion or flexion in which the body will be crowded to the opposite side, the cervix pointing to the side occupied by the tumor (Fig. 198).

Fig. 200

Elevatio uteri following a ventrosuspension of the uterus. Adhesions unite the fundus of the uterus to the abdominal wall and retain the uterus in an elevated position.

Slight lateral displacements of the uterus are commonly overlooked. When found they should always lead to a careful bimanual examination, and, if necessary, these examinations should be under anesthesia, in view of determining the cause of the lateral position. Reference to Figs. 197 and 198 will suggest, in a general way, the mechanism of the displacement. The displacement is due to traction on the one side or to crowding on the other.

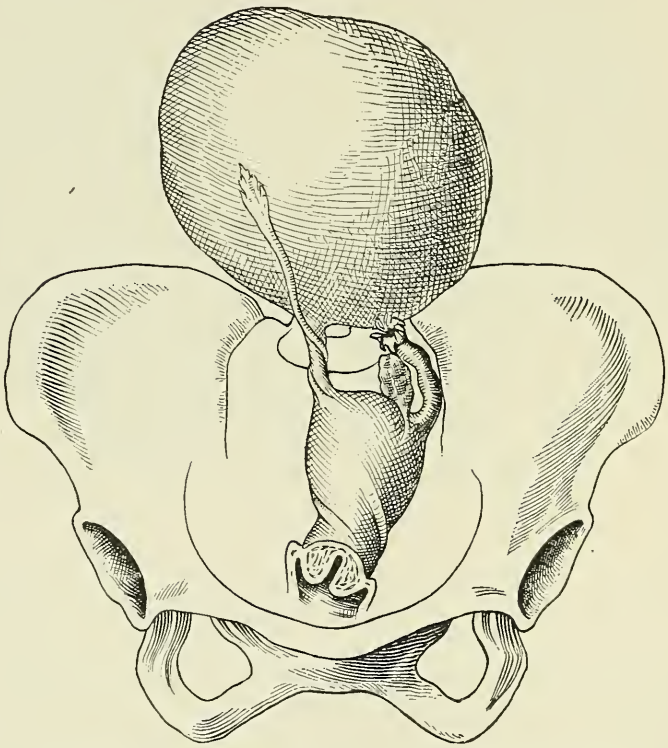
Elevatio Uteri.—In elevatio uteri the uterus is raised above the normal plane and approaches the anterior abdominal wall. In uncomplicated elevatio uteri the long axis of the uterus is straightened. It is unusual to find an uncomplicated elevation of the uterus, such a condition being, as a rule, associated with lateral, anterior, or posterior displacements. The position is physiological in pregnancy. The

extent to which the uterus may be drawn upward is astonishing; a perfectly normal uterus may be raised to the level of the umbilicus.

Causes of elevation of the uterus may be classified under two general heads, namely, swellings below the uterus crowding it upward, or tumors and adhesions making upward traction upon the uterus.

Swellings beneath the uterus and crowding the uterus upward are tumors of the cervix, vaginia, and rectum, hematocele, and hematocolpos. Adhesions binding the fundus to the abdominal wall may develop during pregnancy and the puerperium, leaving the uterus in elevation after the puerperium. Plate XVIII., Fig. 2, represents the uterus suspended from the abdominal wall in an elevated position. A Cesarean section had been performed, and adhesions developed subsequently between the scar in the abdominal wall and that of the uterus.

Fig. 201



Torsion of the uterus caused by twisting of the pedicle of an ovarian cyst.

A subperitoneal fibroid attached to the fundus and growing into the abdominal cavity may elevate the uterus. Either the pedicle must elongate or the uterus will be drawn upward, since the tumor, when it can no longer be accommodated in the pelvis, rises into the

the abdominal cavity. Tumors of ovary with short pedicles may operate similarly.

The vagina will be found greatly elongated and the cervix may not be within reach of the examining finger.

Torsion.—In torsion of the uterus the organ is twisted upon its long axis. This displacement rarely exists singly, but is generally associated with anteposition, lateral position, or elevation. Within perfectly normal limits the uterus is slightly turned upon its long axis, through shortening of the broad ligament which runs outward and slightly backward.

Causes of torsion may be traction on the one hand or pressure on the other. Adhesions running from the side of the uterus backward or forward may turn the uterus upon its long axis, as will also pressure made upon the side of the uterus by tumor formations.

Fig. 201 represents a pedunculated ovarian tumor lying in the abdominal cavity. The tumor has been turned upon its long axis, and with it the uterus has become twisted. It is even possible for the uterus to be severed by the twisting. The blood supply to the uterus may be shut off completely and cause gangrene, or partially and result in atrophy. Menstrual and intermenstrual secretions may be pent up in the uterus above the point of torsion.

As a rule, the displacement is not discovered until an exploratory incision is made to remove the cause.

Prolapsus Uteri.—As suggested by Berry Hart, prolapsus uteri should be considered under the head of displacement of the pelvic floor. The displacement should be regarded as a hernia of the uterus, adnexa, bladder, rectum, and vagina. While the author is in accord with this view, the subject will be considered with other displacements of the uterus. Webster, in his text-book on *Diseases of Women*, holds that prolapsus of the uterus, vagina, urethra, and bladder is the result of failure on the part of the fascial and other tissues supporting these organs between the bony walls of the pelvis to resist intra-abdominal pressure and gravity. If the power of resistance is weakened, or the intra-abdominal pressure and weight of the uterus are increased, or if both factors coöperate, prolapsus will occur. Webster takes exception to the view of Hart, who regards the perineum as a fixed segment for the support of the uterus, and of Thomas, who holds that the perineum is a supporting wedge. By anatomical dissections Webster has demonstrated that the pelvic fascia, and not the perineum and levator ani muscle, are the real support.

The various fascial tissues which meet in the perineum and give support to the pelvic viscera are: (1) The anterior and posterior triangular ligaments. (2) The visceral layer of the rectovaginal fascia. (3) The anal fascia. (4) The deep superficial fascia.

Webster holds that the perineal muscles are of little value as a support compared to the pelvic fascia. In the absence of actual rupture of the fascia, it is possible for stretching alone to so weaken the support that prolapsus will occur.

Prolapsus uteri is a term implying not only a descent of the uterus, but also involvement of the bladder, rectum, vagina, and adnexæ. Descent of the uterus may be checked at any point between the normal position and extreme prolapse.

Nomenclature.—With Webster, the author will speak of (1) descensus uteri, when the uterus and vaginal walls do not descend beyond the vulvar outlet, and (2) prolapsus uteri, when the uterus and vagina protrude beyond the vulvar outlet.

Etiology.—The most frequent displacement of the uterus is descent or prolapse. In the Tübingen clinic, prolapsus of the uterus constitutes 12 per cent. of all the pelvic lesions, ranking first in point of frequency in their case records. The greatest number occur between the ages of thirty and sixty years. That they do not occur with greater frequency before the age of thirty is accounted for by the fact that prolapsus uteri is almost always the result of childbearing. While the forces of labor weaken the pelvic floor and the uterine ligaments, it is usually not until the long-continued influences of intra-abdominal pressure and of gravity have operated upon the poorly supported uterus that the prolapsus develops.

Hence it follows that one or more years usually succeed childbirth before the uterus decends to any considerable degree. This is the rule to which there are few exceptions.

The causes of prolapsus uteri may be outlined as follows:

Loss of support from below.
- Relaxation of the pelvic floor.
- Laceration of the pelvic floor.

Traction from below.
- Cystocele.
- Rectocele.
- Fibroid of the cervix.

Pressure from above.
- Tight-lacing.
- Visceroptosis.
- Abdominal ascites and tumors.
- Straining, as in lifting.

Increased weight of uterus.
- Chronic metritis.
- Fibroids.
- Subinvolution.
- Early pregnancy.

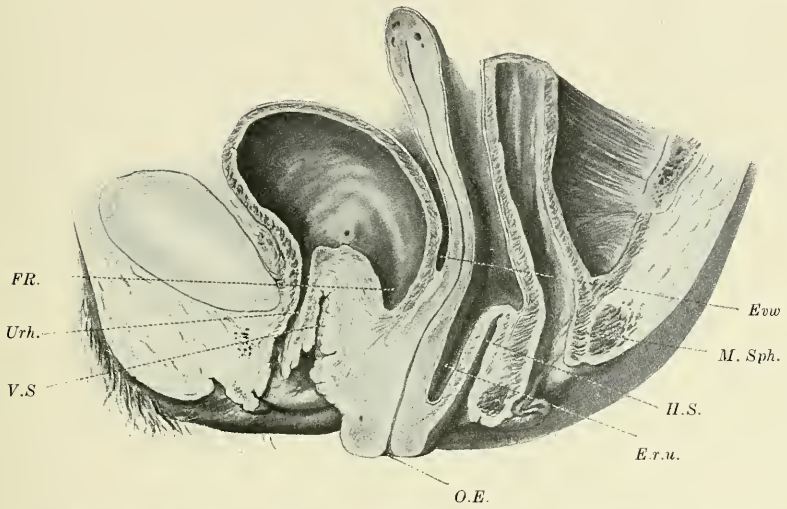
Diagnosis.—The erect posture of the patient is the most favorable in recognizing a downward displacement of the uterus (Fig. 31). In the recumbent position the uterus may wholly or in part resume the normal position. The erect position is awkward and embarrassing, and for these reasons is seldom used. With the patient in the lithotomy position the uterus may be so manipulated as to effectively demonstrate the degree of descensus. Bimanual manipulation, and, if necessary, traction upon the cervix with a vulsellum forceps, will bring the uterus

down to its maximum degree. Under normal conditions it is not possible to draw the vaginal portion of the cervix beyond the vulvar outlet.

Anatomical Diagnosis.—The diagnosis is almost wholly based upon the anatomical findings. It is at times possible to make a diagnosis from inspection alone.

Inspection of the vulva may disclose the uterus and vaginal walls protruding from the vulvar outlet. In nearly all such cases the perineum is lacerated, and there may be a prolapsus of the mucous membranes of the urethra and rectum.

FIG. 202



Prolapse of the uterus in an old woman. Cervix greatly elongated. Cystocele (*FR*) os externum (*OE*) protrudes from the vulva. Vesico-uterine fold of peritoneum (*Evw*) lies relatively high. The cul-de-sac of Douglas (*Eru*) is very deep. The urethra (*Urh*) is in its normal position. *VS*, the anterior vaginal wall; *HS*, the posterior vaginal wall. *M. Sph*, sphincter muscle.

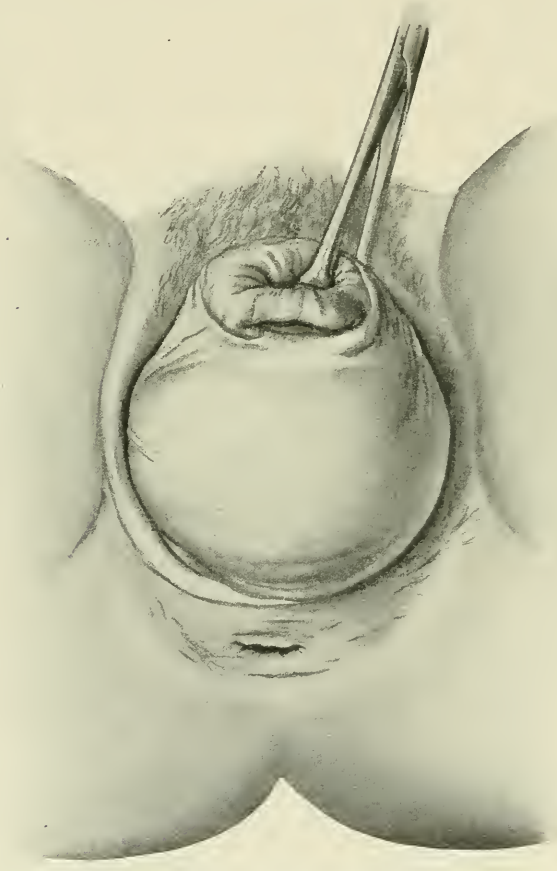
Displacement of the Vagina.—Inasmuch as the uterus is seldom displaced downward without a primary or secondary involvement of the vagina, descensus and prolapsus of the vagina will be first considered.

Descensus Vaginæ.—Descensus vaginæ implies a downward displacement of the vagina to a point near the vulvar outlet. Preceding the descent of the vaginal walls, there is usually a relaxation or laceration of the pelvic floor. As a rule, the anterior wall of the vagina is first to descend; then follows the uterus as it is pulled upon by the sagging wall of the vagina, and, finally, the uterus in turn carries with it the posterior wall of the vagina. It is unusual for the anterior and posterior walls of the vagina to descend simultaneously and equally, and the primary descent of the posterior vaginal wall is more unusual. A limited degree of descensus vaginæ may exist without displacing the uterus.

The descent occurs from below upward; seldom from above downward (Fig. 208).

Prolapsus Vaginæ.—Prolapsus vaginæ implies a protrusion of the vaginal walls beyond the vulvar outlet, and is associated with downward displacement of the uterus. In primary descent and prolapse of the uterus, the vaginal walls are inverted from above downward, there

FIG. 203

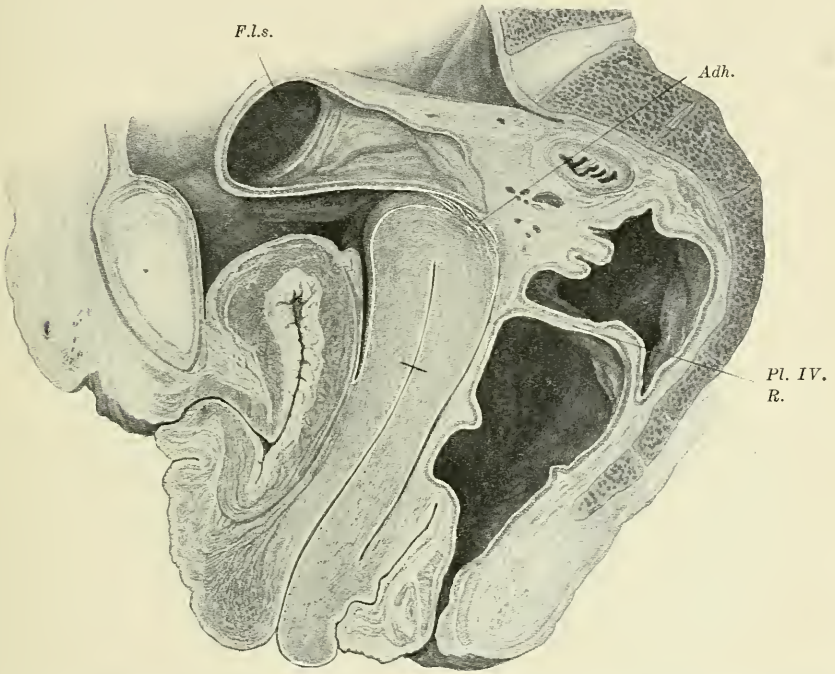


Complete prolapse of the uterus. Complete eversion of the vaginal walls. Hernia of the recto-uterine space.

being no pouching of the vaginal walls as in secondary prolapse of the uterus. The lower segment of the vaginal wall may prolapse, the upper segment invert, and the intervening one remain unchanged. The prolapsed anterior vaginal wall pouches into the vagina, dragging the bladder with it, and forming what is known as a cystocele. The bladder is intimately attached to the anterior wall of the vagina, so that it is impossible for the vagina to descend without carrying the

bladder with it. The vaginal wall loses its usual elasticity, and becomes glistening, dry, and leathery. Decubitus ulcers may form and show but little tendency to heal. Between the posterior wall of the vagina and the rectum no close attachment exists—a fact which explains why in prolapse of the posterior vaginal wall the rectum does not always descend with the vagina.

FIG. 204



Total prolapse of anterior vaginal wall. Partial inversion of posterior vaginal wall. Rectum distended and crowding the uterus forward. Partial prolapse of the uterus with elongation of the cervix. Cystocele. *Adh.*, adhesions. (Tandler and Halban.)

Descensus and prolapsus vaginæ are recognized by inspection and palpation of the vagina. Holding the labia apart, the vaginal pouch, with its transverse folds, is seen to bulge into the introitus. Inversion of the vagina is recognized by a corresponding shortening of the vaginal wall, together with a probable descent of the uterus.

Displacements of the Uterus.—After inspection and palpation of the vulva and vagina, the position of the uterus is to be determined. The vaginal walls may be prolapsed to an extreme degree without altering the position of the uterus, though this is rare. In a prolapse of the vagina one expects to find a secondary descent of the uterus. The descent of the uterus may be either primary or secondary.

Primary Descent and Prolapse.—Primary descent and prolapse of the uterus are the result of relaxed uterine supports, of added weight

to the uterus, or of increase in the intra-abdominal pressure. As the uterus descends, the anterior and posterior walls of the vagina become inverted from above downward, and near the outlet of the vagina the walls are relaxed. In exaggerated cases the vaginal walls may be completely inverted, thereby permitting the uterus to protrude beyond the vulvar outlet.

Fig. 205

Secondary prolapsus uteri, with elongation of the cervix. Both vaginal walls are completely inverted. The cervix protrudes from the vulva. Neither the bladder nor the rectum is found in the protruding structures.

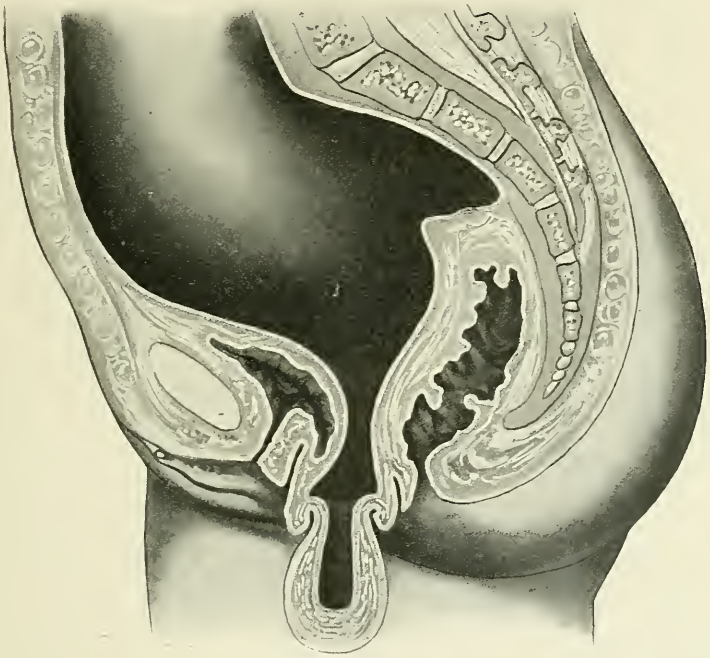
Secondary Descent and Prolapse.—Secondary descent and prolapse of the uterus follow upon a primary prolapse of the vaginal walls. As the walls of the vagina descend, traction is made upon the uterus at the point of attachment of the vagina. If the supports of the uterus offer little or no resistance, the walls of the vagina, assisted by gravity and intra-abdominal pressure, will inaugurate a descent of the uterus. If, however, the normal supports of the uterus, assisted by adhesions and newgrowths, retard the descent of the uterus, there will usually follow an elongation of the cervix in its supravaginal portion. Furthermore, since the anterior wall of the vagina is first to prolapse, the anterior lip of the cervix will be elongated to a greater degree than will the posterior lip. If there is a simultaneous prolapse of both vaginal walls, the two lips of the cervix will be equally elongated. Hence, in

secondary prolapse of the uterus there is usually an elongation of the cervix, while in primary prolapse there is no such change.

In complete prolapsus uteri with inversion of both walls of the vagina, the cervix, having been previously elongated, will retract more or less and may be materially shortened. The direction of the long axis of the uterus varies with the descent. The usual position in descensus uteri, when the uterus lies in the pelvis, is that of retroversion, and this position is exaggerated as the uterus descends.

The adnexæ are drawn down by the uterus, and in complete prolapsus are found in a funnel-like depression formed of peritoneum.

Fig. 206

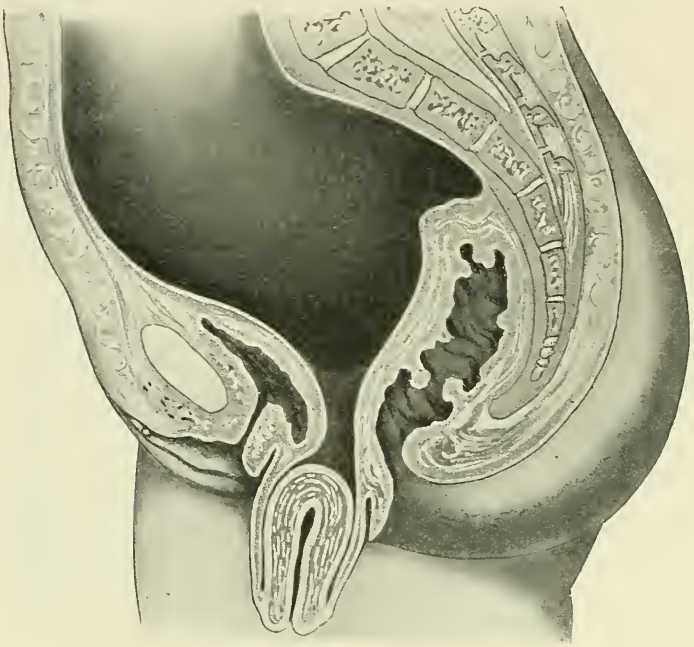


Complete inversion of the uterus.

The bladder is so intimately connected with the anterior vaginal wall and cervix that it must necessarily share in the displacement of the uterus. As the anterior wall of the vagina pouches it drags upon the base of the bladder. In this manner a cystocele is formed which, in complete prolapse of the vagina, may include the greater portion of the bladder, causing it to protrude from the vulvar orifice. The exact limitations of a cystocele are determined by the catheter or sound placed in the bladder. When the bladder is distended the cystic mass is felt and seen to protrude into the vagina; its outlines can usually be determined by inspection.

The rectum is more loosely connected with the vaginal wall than the bladder. The loose connective tissue may permit of a complete prolapse of the posterior wall of the vagina without displacing the rectum. More often there is a pouching forward of the rectum into the vaginal pouch (rectocele). By direct palpation through the rectum the location and extent of the rectocele are determined.

Fig. 207



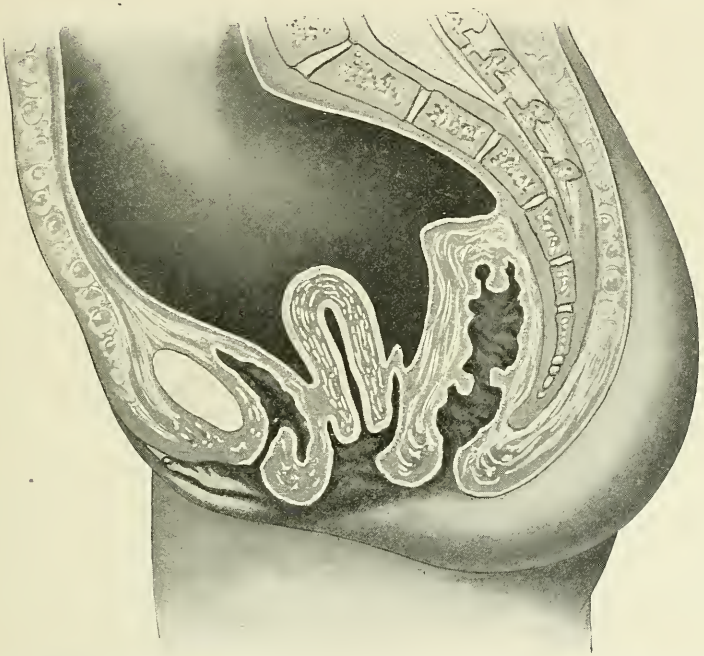
Primary prolapse of the uterus. The uterus lies wholly outside the vulva. The vaginal walls are completely inverted. The cervix is not elongated.

The anatomical changes occurring in the prolapsed tissues are largely the result of disturbance in circulation, of exposure to the influences of air, and of friction of the thighs. There is first congestion and edematous infiltration, this being followed by induration (hyperplasia) of the tissues. Decubitus ulcers, slow in healing, may form on exposed surfaces. When the lips of the cervix are retracted by the vaginal walls, the exposed mucous membrane of the cervix may be transformed into stratified epithelium.

Clinical Diagnosis.—The diagnosis of descensus and prolapsus uteri is seldom difficult. It is unusual to find a prolapsed uterus in a nullipara. Beyea estimates that prolapsus uteri in nulliparæ occurs in not more than 1 per cent. of all cases. He reported two cases and found sixty-two others in the literature.

When, upon physical examination, the pelvic floor is found relaxed or lacerated, and there is also found a rectocele and vesicocele, it may be that the uterus will be found more or less prolapsed. A positive diagnosis can only be made by locating the fundus of the uterus in a bimanual examination. The patient being under anesthesia, firm traction upon the cervix with the vulsellum forceps will determine the exact extent of the displacement (Fig. 209). The finding of the cervix at a lower level than is normal will not suffice for a diagnosis. Such a finding is frequently due to an elongation of the cervix, either with or without a descent of the uterus. Without having located the fundus

FIG. 208



Secondary descent of the uterus. The uterus is retroverted and lies on a plane lower than normal. The cervix does not extend to the vulvar outlet. The anterior vaginal wall is prolapsed and the posterior vaginal wall is partially inverted.

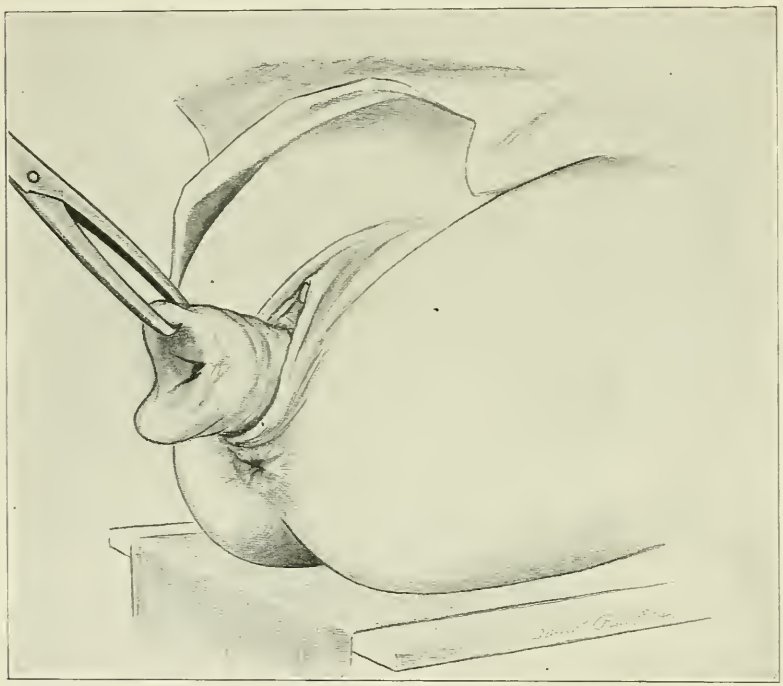
it cannot be said that the uterus, as a whole, has descended. By a rectal examination it is often possible to locate the point of juncture of the cervix and uterine body and estimate, with some degree of accuracy, the length of the cervix. Measuring the depth of the uterus by the sound will give exact information.

It is more difficult to determine whether it is the supravaginal or the infravaginal portion of the cervix that is elongated. This is ascertained by noting the depth of the vault of the vagina. If decreased in depth, the supravaginal portion of the cervix is elongated; if it remains at the

normal level, the infravaginal portion of the cervix is elongated. Both the infravaginal and the supravaginal portions of the cervix may be increased in length, in which event there will be little change in the depth of the vault of the vagina.

When the uterus is completely prolapsed it is possible to approximate the hands over and above the body of the uterus, having merely the vaginal walls and bladder between the fingers. By so doing it is possible to absolutely exclude all other conditions (Fig. 211).

Fig. 209



Elongation of the cervix with prolapsus uteri. Traction made upon the cervix by a vulsellum forceps pulls the cervix two inches beyond the vulvar outlet. The body of the uterus lies within the pelvis, but at a lower level than normal. The depth of the uterine cavity, measured by a sound, is five inches.

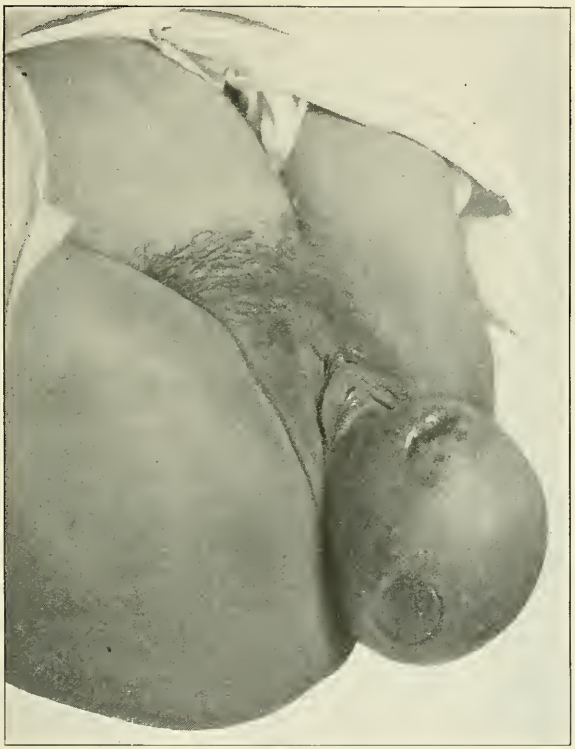
Can the displacement of the vagina and uterus be corrected? This question will naturally arise before the diagnosis is complete. An attempt to replace the uterus may be made without anesthesia, but when there is much tenderness, or when great difficulty is encountered, an anesthetic should be given. Among the hindrances to the replacement of the uterus may be mentioned pelvic tumors, adhesions, inflammatory exudates, and swelling from edema and induration of the uterus and vagina.

While the clinical symptoms cannot be relied upon in the diagnosis of prolapsus uteri, they are fairly constant and deserve consideration.

Backache is the most common complaint, but is more often due to diseases of the adnexæ and to inflammatory exudates complicating prolapsus.

Feeling of weight, pressure, and traction is to be accounted for by the increased size of the uterus, by pressure upon neighboring structures and by traction upon adhesions and the natural supports of the uterus.

Fig. 210



Prolapsus uteri. The external os is lacerated and eroded. On the side of the prolapsed uterus is a decubitus ulcer. (Case of Dr. J. Clarence Webster.)

Leucorrhea and menorrhagia are the results of passive congestion of the uterus, which in turn is the result of the displacement.

Sterility is due to mechanical hindrances and to complicating lesions in the uterus and adnexæ. Pregnancy in a prolapsed uterus will either terminate spontaneously or go on to full term. Abortion is most likely to occur about the fourth month, when the pregnant uterus can no longer be accommodated in the limited space of the pelvis. If, however, the uterus does rise into the abdominal cavity the prolapsus is relieved

for the period of pregnancy. Involution in the puerperium is likely to be retarded, and the lochial discharge may remain bloody an unusually long time.

Disturbances of the bladder functions are almost constant, and are explained by pressure upon the bladder and the displacement of the bladder and urethra. Retention of the urine is possible even to the point of rupture of the bladder. Cystitis may develop.

The rectal functions are generally disturbed, though not to the extent and frequency found with the bladder. Constipation, rectal tenesmus, and hemorrhoids are the result of pressure made upon the rectum by the prolapsed uterus.

Fig. 211

Bimanual palpation of the prolapsed uterus.

Differential Diagnosis.—Prolapsus uteri is most often confused with an elongated cervix. The vaginal portion of the cervix may be so enormously enlarged as to resemble a prolapsed uterus. The differential diagnosis has been considered in a previous paragraph.

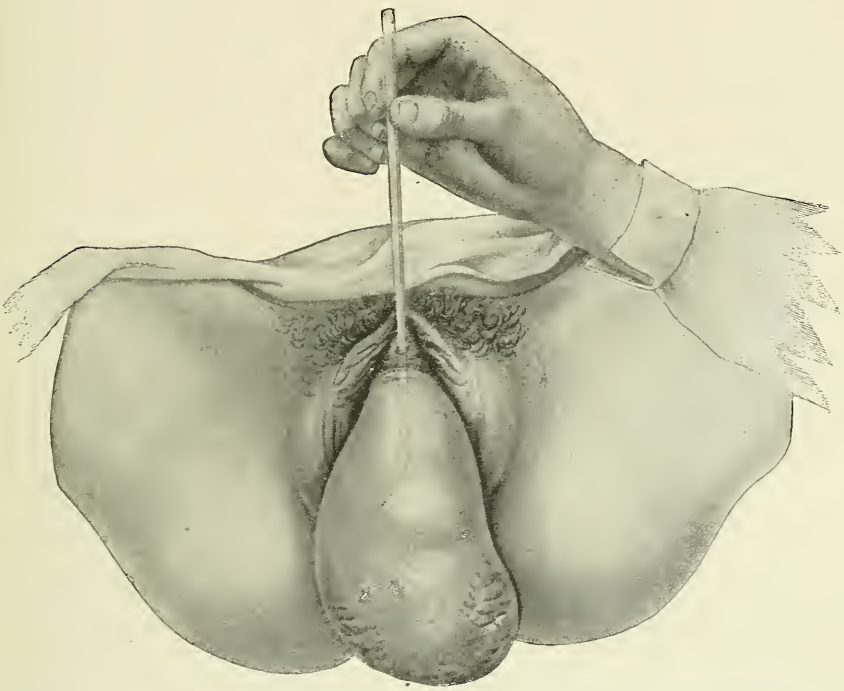
Complete prolapsus uteri with atresia of the cervix may be mistaken for an inverted uterus. The finding of the fundus will clear up the diagnosis.

A large cyst of the vagina may protrude from the vulva, and on superficial examination be mistaken for a prolapsed uterus. Such

cysts do not lie in the median line; they fluctuate, and are covered with thin mucous membrane. A recto-abdominal examination, under anesthesia if necessary, will enable the examiner to locate the body of the uterus in its normal position.

A pedunculated, submucous fibroid protruding into the vagina, or a pedunculated fibroid of the cervix, may be mistaken for a prolapsed uterus. The absence of the external os in the advancing body, the finding of the fundus within the pelvis at its normal level, and the passage of a sound into the uterine cavity will clear the diagnosis.

FIG. 212



Prolapse of the third degree. Uterus protruding through the vulva. Sounds demonstrate the bladder to be in complete descent with the uterus. (Schaffer.)

Treatment.—The treatment of prolapsus uteri necessarily embraces the correction of a relaxed and torn pelvic floor and vaginal walls, amputation of an elongated cervix, and the management of the many complications in the uterus and adnexæ that are associated with this form of displacement.

Prophylaxis.—As a preventive measure the early repair of injuries to the pelvic floor is of the highest importance. Indeed, if such conditions were not neglected, prolapsus uteri would cease to occupy such a prominent place among the lesions of the pelvis. The early repair of the lacerated perineum would eliminate a large proportion of the

cases, but by no means all, for we have to reckon with the relaxed outlet and pelvic floor, with the overstretched ligaments of the uterus and the intra-abdominal pressure.

Modern obstetrical teaching is sufficiently clear in the emphasis it places upon the immediate repair of the pelvic floor, but the gynecologist is chary in his account of the early repair of the neglected injuries to the pelvic floor. The recent lacerations of the perineum, the relaxed vaginal walls which are beginning to drag upon the cervix, and the undue laxity of the overstretched ligaments which have failed to retract; these should be corrected as early as possible after the completion of the puerperium.

The correction of a prolapsed uterus in the early stage presents the least difficulties, and assures the best and most lasting results. In the later stages the operation is more complicated, and the sequential results observed in the uterus and in the neighboring organs may make full restoration to health impossible. It therefore follows that the earlier the operation the better the results.

The following precautions should be observed:

A. In labor:
   1. Do not encourage patients to bear down until nature excites the inclination.
   2. Do not apply forceps until the cervix is fully dilated.
   3. Avoid, as far as possible, all means of hastening the second stage of labor.
   4. Repair all wounds of the cervix and pelvic floor immediately after labor.

B. During the puerperium:
   1. Keep the patient in bed ten to fourteen days.
   2. Prevent overdistention of the bladder and constipation.
   3. Examine patients at the end of six weeks and make the necessary repair of existing injuries.

Preliminary Treatment.—Before resorting to operation certain steps should be taken in preparation for operation. If the general health of the individual is such as to render an operation hazardous, time should be taken to restore these conditions so far as it is possible. Furthermore, there are local conditions which demand attention before operating. The pelvic congestion, so commonly associated with prolapsus, should be relieved, and ulcers on the vaginal walls should be healed.

General Treatment and Hygiene.—Careful attention should be directed to rest, exercise, baths, diet, and the care of the bowels. All constriction about the waist line should be removed and a straight front corset or abdominal binder worn to give support to the abdominal organs. Constitutional treatment should be given when indicated.

Replacement of the Uterus.—To relieve the pelvic congestion and ulcerations of the vaginal walls and cervix, it is essential to first replace the uterus and to keep it in place by a temporary support. All constricting clothing is removed from the waist, the bowels and bladder

are emptied, and the patient put in the knee-elbow position. The uterus is then grasped by the hand and gently forced into the vagina, following the line of least resistance. Unless adhesions exist or the size of the uterus will not permit of its free mobility, the organ readily assumes its normal position. It is rarely necessary to give an anesthetic. In acute displacements the associated congestion and edema may greatly enlarge the protruding uterus. In this event it may be necessary to elevate the hips and apply hot fomentations to the protruding mass for several hours before attempting to effect a replacement.

As a rule, the patient herself is able to replace the uterus by lying in the knee-elbow or lithotomy position and forcing the projecting mass back with her fingers (Fig. 213).

Fig. 213

Patient assumes the knee-chest position and pushes the prolapsed uterus high into the vagina.

Tampons.—To temporarily hold the uterus at its normal level, two or more lambs' wool tampons should be inserted high in the vagina while the patient is in the knee-elbow position. These tampons should be applied daily, and if difficulty is experienced in retaining the tampons in the vagina, a T-binder should be worn over a vulvar pad of gauze.

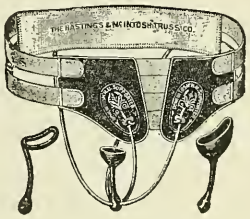
Vaginal Douches.—In order to protect the vaginal surfaces from irritating discharges, a mild antiseptic vaginal douche should be given once or twice daily. For this purpose the author usually prescribes lysol solution, 1 to 1000. When tampons are worn the douche is given before replacing the tampon.

Treatment of Ulcers and Erosions.—As a rule, these lesions will heal spontaneously if the uterus is replaced and the vagina kept clean by

douches. When the healing is slow the ulcers may be stimulated by the application of a 10 per cent. silver nitrate solution, the application being made twice a week.

Pessaries.—After these preliminary measures have been employed, with the result that congestion has been relieved and ulcerations have healed, it is then necessary to provide a more permanent support. It is not always advisable to operate and not all patients will accept such advice. When the patient is old or afflicted with diabetes, disease of the lungs, heart, or kidney, or with any other disease that will render an operation hazardous, the next step will be to adjust a suitable pessary. This is by no means an easy problem. The ordinary pessaries, such as the Hodge or Albert-Smith, will be useless. When the pelvic floor is fairly intact it may be possible to adjust a ring pessary, but in the majority of instances nothing will serve the purpose short of a cup and stem pessary attached to an abdominal support (Fig. 214). This pessary should be removed at night and the ring or cup should be cleansed daily; the vagina also should be irrigated daily, to prevent the development of ulcers.

Fig. 214



McIntosh uterine support for prolapsus.

Colpeurynter.—When the pessary causes pain and discomfort a colpeurynter (Braun) will provide relief. The same precautions should be taken in the wearing of a colpeurynter as in the wearing of a pessary. If the vaginal walls and cervix become irritated the colpeurynter should be anointed with zinc oxide ointment.

Technic of Operation.—To successfully restore a prolapsed uterus, due regard must be paid to all associated lesions, otherwise the results will not be satisfactory. Not only must the uterus be permanently restored to the normal position, and in such manner as to avoid any possible interference with the normal functions of the pelvic organs, but the cervix, vaginal walls, and pelvic floor will usually demand the attention of the surgeon if the uterus is to remain in its corrected position. This requires plastic surgery on the pelvic floor, to be followed during the same anesthetic by the abdominal work. The precaution is taken to make a complete change of gown, gloves, instruments, and surgical appliances in the interim between the vaginal and abdominal operations.

The following is the usual order of procedure:

1. Curettage.
2. Anterior colporrhaphy when there is relaxation of the anterior wall of the vagina.
3. Amputation of the cervix when it is elongated or deeply lacerated.
4. Colpoperineorrhaphy.
5. Shortening of the round ligaments or—
6. Amputation of the body of the uterus, and fixation of the stump to the abdominal wall.

It will be observed that the author has not advised fixation of the body of the uterus to the abdominal or vaginal walls, for reasons which will appear later.

1. *Curettage.*—The endometrium is commonly hypertrophied in prolapsus and gives rise to leucorrheal discharges. (See page 126.)
2. *Anterior Colporrhaphy.* (See page 294.)
3. *Amputation of the Cervix.*
4. *Colpoperineorrhaphy.* (See page 763.)
5. *Shortening of the Round Ligaments.* (See page 368.)
6. *Amputation of the Body of the Uterus and Fixation of the Stump to the Abdominal Wall,* a procedure credited to Baldy.

The removal of the body of the uterus, followed by the fixation of the cervical stump to the abdominal wall, is unquestionably the best procedure when there is great relaxation of the uterine supports and the patient is incapable of childbearing, either for reasons of advanced age or for anatomical conditions, such as uterine fibroids and chronic metritis.

Baldy Operation.—After a supravaginal amputation of the uterus, the cervical stump is fixed to the abdominal wall at the lower end of the incision. Two silkworm-gut sutures are used for this purpose. They are made to transfix the cervical stump from side to side and are brought through the peritoneum, muscle, and deep fascia on either side of the abdominal incision. They are then securely tied and the ends of the sutures cut close to the knots, after which the abdominal incision is closed in the usual manner. Before closing the abdomen care must be exercised in coapting all peritoneal surfaces about the cervical stump and broad ligaments. This is done with a continuous catgut suture.

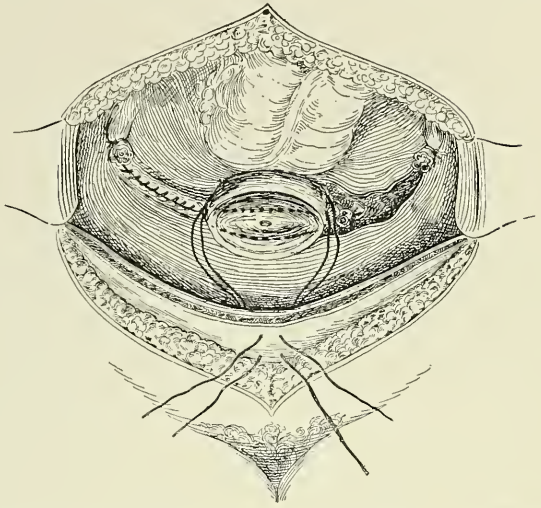
Baldy does not now bury the fixation sutures, but passes them completely through the abdominal wall, as in the operation of ventral fixation, and denudes the under surface of the abdominal wall where it comes in contact with the cervical stump, for fear the support may be weakened by the stripping of the peritoneum.

The author does not favor vaginal hysterectomy, total abdominal hysterectomy, or vaginal fixation of the uterus.

Results in Operations for Prolapsus Uteri.—From a large number of home and foreign clinics the following statistics have been obtained: In 1000 plastic operations upon the cervix, vaginal walls, and perineum there has been no return of the prolapsus after many years in 70 per

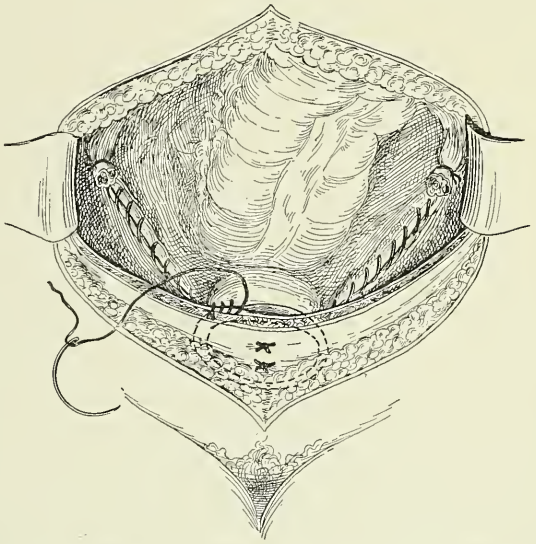
cent. of the cases. Of the 30 per cent. of failures only 5 per cent. were complete. The recurrences were largely ascribed to subsequent childbearing.

Fig. 215



Baldy operation for prolapsus uteri. Body of uterus amputated. Non-absorbable sutures are passed through the abdominal wall and transfix the stump of the cervix. Under surface of the abdominal wall denuded to insure firm fixation of stump.

Fig. 216



Baldy. operation for prolapsus uteri. Stump of cervix fixed to abdominal wall by non-absorbable sutures passed through abdominal wall and stump of cervix. Peritoneum stitched about attachment of cervix to the abdominal wall.

Herff obtained "relatively good results" in 78.1 per cent. of his cases of partial prolapsus in which only plastic operations were performed; when vetrofixation was done in addition to the plastic operations, there were 76.9 per cent. of recoveries, and when the prolapsus was extreme, there were 75 per cent. of recoveries.

Dohrn operated on 65 cases of prolapsus by the Hegar plastic operation and obtained the following results:

28 cases with 43 per cent. of good remote results;

13 cases with 20 per cent. of slight recurrences;

24 cases with 37 per cent. of marked recurrences.

Winter records 37 operated cases of prolapsus uteri, with the following results:

31 cases with 83.8 per cent. of good remote results;

5 cases with 13.5 per cent. of partial recurrences;

1 case of complete recurrence.

Baatz operated on 36 cases which had passed the climacterium, doing plastic procedures combined with vaginofixation, with 76.3 per cent. of good remote results.

The cases of Winter combined plastic operations with vaginal fixation, ventrofixation, and the Alexander-Adams operation. Winter had but one recurrence in 21 cases of prolapsus plus retroversion in which the plastic operations were combined with vaginofixation.

When total extirpation was carried out for relief from complete prolapse of the uterus and vaginal walls, Bumm obtained complete relief from all functional disturbances in 30 cases out of 43, and in only 3 cases was there no improvement in the ability of the patients to work.

Prolapse of the Pregnant Uterus.—A moderate degree of descent of the uterus is common in early pregnancy, but complete prolapse of the pregnant uterus is rarely seen. Furthermore, a moderate descent of the pregnant uterus does not seriously influence pregnancy or delivery, but a complete prolapse of the pregnant uterus has never been seen beyond the seventh month of gestation.

Time of Occurrence.—Nulliparæ rarely have a prolapsed uterus. The condition is usually seen in women who have borne one or more children.

Degree of Prolapsus.—The extent to which the pregnant uterus may prolapse varies from a slight descensus to a complete delivery of the gravid uterus. Several cases are recorded in which the pregnant uterus reached to the level of the knees.

Tissue Changes in a Prolapsed Uterus Which Lessen the Chances of Pregnancy.—Pregnancy is not likely to occur in a prolapsed uterus where the vaginal walls protrude, the cervix is greatly elongated, the lips of the cervix are eroded or ulcerated, the cervical canal plugged with mucus, the endometrium and uterine musculature thickened through hyperplastic changes, the tubes and ovaries displaced and their structure altered through persistent passive congestion. These conditions are common to prolapsus of long standing.

Events following upon Pregnancy in a Prolapsed Uterus.—1. In moderate degrees of prolapse, the uterus rises out of the pelvis in the fourth month of gestation, and for the remaining months of gestation the displacement is corrected only to return, and possibly in an exaggerated state, in the puerperium.

2. In extreme prolapsus and when the uterus is fixed in the pelvis, spontaneous reposition of the uterus is impossible. Either the pregnancy will terminate before term or the pregnant uterus must be replaced by bimanual manipulations or by operative interference. As a rule, the pregnancy will be terminated in the early weeks of gestation.

3. When the pregnancy is interrupted spontaneously there is usually an incomplete emptying of the uterus, due to the faulty contractions of the uterus and to the elongated cervix.

4. Puerperal and postabortive infections are common because of the ineffectual emptying of the uterus, the necessity for operative interference, and the occasional presence of ulcers of the cervix.

5. Labor is retarded by faulty uterine contractions and the presence of a rigid, elongated cervix. The resistance of the cervix may be so great as to result in a spontaneous laceration of the uterus.

Treatment.—The following propositions may be laid down as guides for the management of these cases:

1. In descent of moderate degree no treatment may be called for.

2. In the early months of pregnancy, when more or less distress is occasioned by a sagging uterus, a suitable pessary may be worn or the patient enjoined to rest in the recumbent posture for several hours daily. All unusual exertion is prohibited, and the dress must be free from constriction and traction at the waist line.

3. In acute prolapse of the pregnant uterus no time should be lost in replacing the uterus by taxis, and this must be followed by a prolonged rest in bed.

4. In retarded labor due to a long, rigid cervix a bilateral incision should be made in the cervix and the child delivered by forceps or by version. Vaginal or abdominal Cesarean section may be performed in selected cases.

5. If the cervix presents at the vulvar outlet during the puerperium, an antiseptic vulvar pad should be worn to prevent sepsis. The elongated cervix of the pregnant uterus has been amputated without interrupting pregnancy.

Inversion of the Uterus.—**Definition.**—Inversion of the uterus is the partial or complete turning inside out of the uterus.

Etiology.—I. Puerperal causes:

1. Short cord.
2. Cord wrapped around the neck of the child.
3. Forcible expression of the placenta.
4. Traction on the cord.
5. Rapid labor.
6. Uterine inertia.

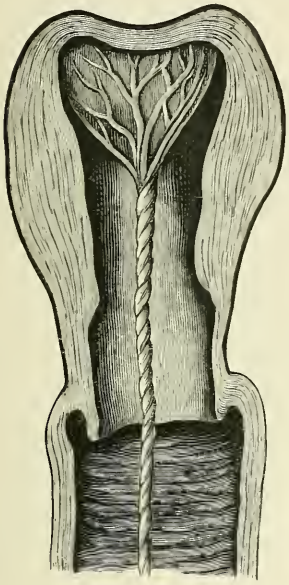
II. Non-puerperal causes:

1. Pediculatated submucous fibroids attached to the fundus.
2. Unknown conditions.

Puerperal inversion is by far the most common form. It occurs in the puerperium nine times more frequently than at all other times.

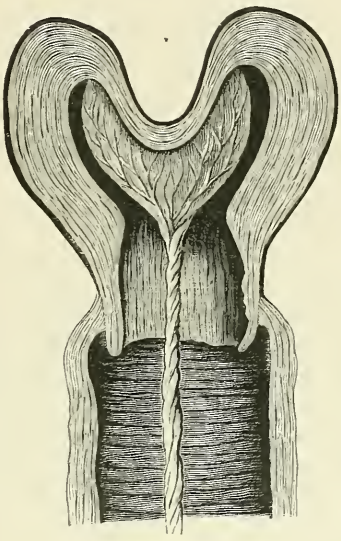
Traction upon the cord in retained placentæ is the usual way in which the accident occurs (Figs. 217 and 218).

Fig. 217



Beginning inversion of uterus, placenta attached. (Modified from Ribemont-Dessaignes and Lepage.)

Fig. 218



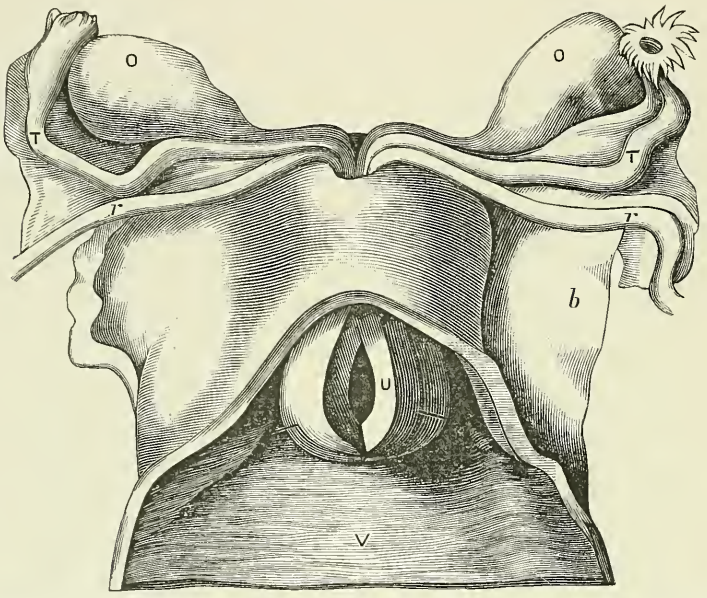
Cup-shaped depression of fundus. (Modified from Ribemont-De saignes and Lepage.)

In 192,000 labors at the Rotunda Hsopital, in Dublin, but one case is reported. Kehrer's estimate is 1 in 2000 labors. The one essential condition in all inversions of the uterus is atony of the musculature in some part of the uterine body. Predisposing factors to atony of the uterus are frequent childbearing, protracted labors, hydramnios, twin pregnancy, precipitate labors, and repeated miscarriages. With these conditions operating to fatigue and relax the uterine musculature, it needs only such procedures as traction upon the cord and compression of the fundus to effect an inversion.

Spontaneous inversion may occur during or immediately following the third stage of labor, the mechanism being not unlike that of intussusception of the bowels. Of 100 cases of inversion of the uterus collected by Beckmann, 54 were spontaneous, 21 were directly caused

by traction upon the cord, and 25 were from unknown causes. Of the spontaneous cases many were accounted for by the presence of short cords or cords twisted about the neck of the fetus. Immediately upon expulsion of the child, a vacuum is created in the uterus, and if, in addition, there is atony of the fundus, the intra-abdominal pressure may produce an inversion.

Fig. 219



The inverted uterus *U*, lying in the vagina *V*, is cut open to show the peritoneal sac, which does not contain the ovaries *O*, *O*. Bristles are passed into the uterine orifice of the tubes. *b*, broad ligament; *r*, *r*, round ligament; *T*, *T*, tubes. (Hart and Barbour.)

It is difficult to account for inversions occurring late in the puerperium. Those due to tumor formations in the body of the uterus are of rare occurrence. Such tumors operate first by weakening the uterine wall, and, second, by making traction upon the atonic area. Pedunculated fibroids arising from the fundus are forced through the cervix into the vagina by the contractions of the uterus. If there is relaxation of the uterine wall at the point of attachment, this action may cause an inversion of the fundus.

Olshausen reported a case of inversion in a girl, aged eighteen years. There was no assignable cause. This is one of the few cases of spontaneous inversion occurring independent of labor and newgrowths.

Anatomical Diagnosis.—Three grades of inversion are recognized:

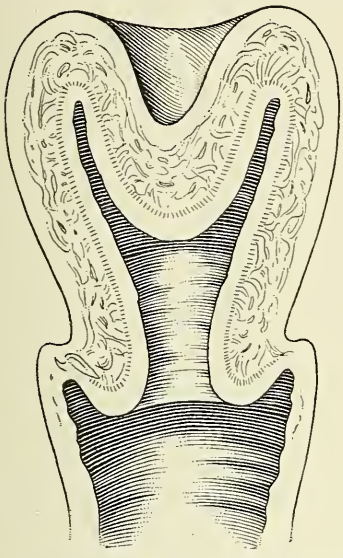
1. When the fundus lies within the uterine cavity.
2. When the fundus lies within the vagina.
3. When the entire uterus protrudes from the vulva.

In the depression formed by the inverted fundus are found the

tubes, ovarian ligaments, and part of the round and broad ligaments. The ovaries are rarely found within the depression. The mucosa, covering that portion of the inverted fundus lying within the vagina and external to the vulva, undergoes retrogressive changes. In the beginning there is marked congestion; later erosions and true ulcers may develop, and the covering of columnar epithelium may be converted into many layers of stratified squamous cells.

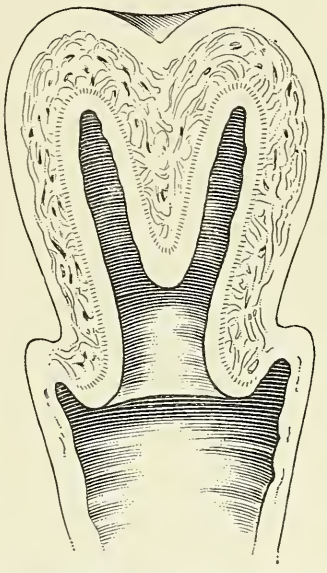
Sloughing and gangrene of the inverted uterus may result from interference with the circulation.

Fig. 220



Partial inversion of the uterus; the inverted fundus lies within the cavity of the uterus.

Fig. 221



The uterus is divided by a septum from the fundus to the internal os.

Following the congestion of the inverted body is an enlargement of the uterus from hyperplasia, which, when of long standing and far advanced, may prevent replacement of the inverted fundus.

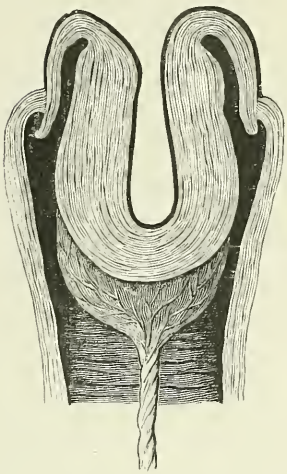
From the tubes infections may travel to the ovary, pelvic connective tissue, and peritoneum. Adhesions may bind together the tubes, ovaries, and coils of intestines within the funnel-shaped depression.

Clinical Diagnosis.—The diagnosis can only be made with certainty by a physical examination. Subjective signs awaken no more than a suspicion of the accident. The inversion may take place suddenly or slowly, and is referred to as acute or chronic. There is a sensation of something giving way in the pelvis, and this is immediately followed by hemorrhage. The loss of blood may result fatally, or may be limited in amount and merely prolong the menstrual flow. In the intervals of the bloody flow there is a profuse serous or seropurulent discharge.

Partial inversion may occasion no symptoms and may escape notice. The functions of the bowel and bladder are disturbed, and general physical exhaustion follows.

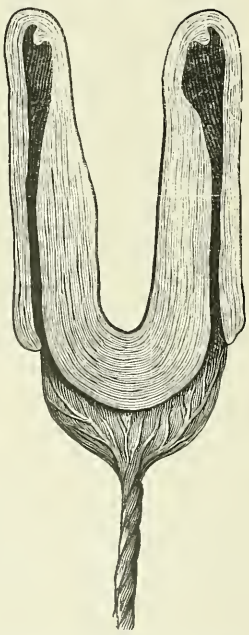
Under favorable conditions for making a bimanual examination it is possible to demonstrate, by the hand over the abdomen or in the rectum, the absence of the fundus and in its place a funnel-shaped depression. By the fingers in the vagina the inverted fundus is found to bulge into the cavity of the uterus, into the vagina, or beyond the vulvar outlet. A sound placed within the bladder may assist as a guide in the bimanual examination. The finger in the rectum may be made to meet the sound in the bladder or the hand on the abdomen, thereby demonstrating the absence of the uterine body. In the protruding fundus are seen the tubal openings, there being no external os. When the inversion is not complete, the cervix may form a contraction ring about the presenting fundus.

Fig. 222



Partial inversion of uterus. Modified from Ribemont-Dessaignes and Lepage.)

Fig. 223



Complete inversion of uterus. (Modified from Ribemont-Dessaignes and Lepage.)

By drawing upon the fundus with one hand, the fingers of the other hand in the rectum may be hooked over the margin of the funnel-shaped depression.

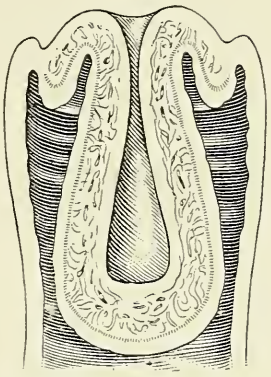
A sound passed into the vagina and between the protruding fundus and cervix will extend a limited distance, and equally so, around the entire circumference. In puerperal inversion the free, rounded, bleeding

mass, with its soft, shaggy surface protruding into the vagina, should suffice for a diagnosis when associated with the disappearance of the usual abdominal tumor.

Differential Diagnosis. — Pedunculated fibroids and polyps lying within the vagina are to be differentiated from inversion of the second degree by locating the fundus of the uterus within the pelvis by means of a recto-abdominal examination; second, by passing a sound into the uterus and finding the cavity of normal or increased depth; third, by the absence of tubal openings in the protruding mass.

Submucous polyps and fibroids lying within the cavity of the uterus show, by the passage of the sound, an increase in the depth of the cavity of the uterus, and by a recto-abdominal or vagino-abdominal

Fig. 224



Complete inversion of the uterus.

Fig. 225

Inverted uterus. Recto-abdominal examination in which the finger in the rectum demonstrates the absence of the fundus.

examination the fundus is located within the pelvis. Care must be taken in passing the sound that the growth does not obstruct the passage of the instrument, giving the impression that the uterine cavity is shortened.

A partially divided uterus with a depression in the fundus may, in the passage of the sound and palpation of the fundus, suggest a partial inversion. (See Figs. 220 and 221.)

Submucous fibroids with partial inversion may not be recognized from a simple inversion before operating for the removal of the tumor.

Prolapsus uteri is distinguished from an inversion by the obliteration of the vaginal fornices, by finding the external os at the bottom of the protruding mass, and by the absence of a cup-shaped depression in the fundus. A sound passed through the cervix will sink to the depth of the normal uterine cavity.

Fig. 226

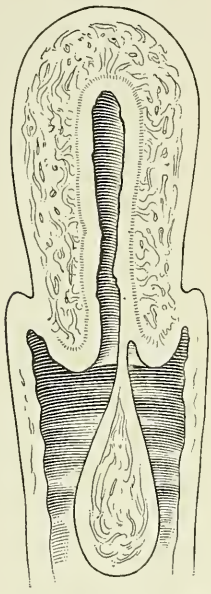


Fig. 227

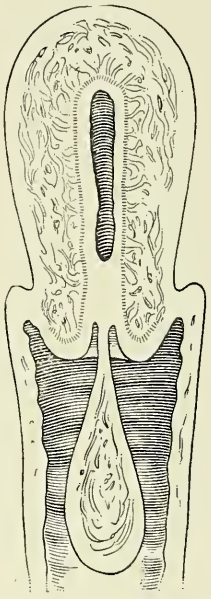


Fig. 226.—Cervical polyp, possible to mistake for an inverted fundus. The differential diagnosis is made by passing a sound into the uterine cavity and by locating the fundus in a bimanual examination.

Fig. 227.—Cervical polyp with atresia of the cervix. A sound cannot be passed into the uterus, but the fundus is located within the pelvis by a conjoined examination.

Treatment.—*Prophylaxis.*—Traction on the cord, in the effort to deliver the placenta, and forcible expression of the placenta by the Credé method, give rise to the larger number of inversions. So far as concerns prophylaxis it need only be mentioned that such practices should be conducted with caution.

Reduction by Taxis.—The method of manual reduction is adapted to cases of acute postpartum inversion, and should be instituted at the earliest possible moment.

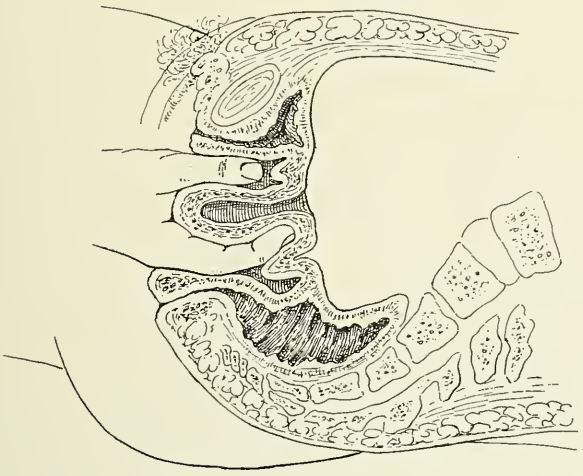
The methods of taxis differ according to the obstacles to be overcome. If the cervix does not form too tight constriction of the protruding

fundus, the best procedure is to push steadily and firmly upon the most prominent portion with the conated hand, until the fundus has been replaced. In cases of longer standing the protruding body may

FIG. 228

Reduction by taxis of an inverted uterus.

FIG. 229



Reduction by taxis of an inverted uterus.

be reduced in size by compressing the body firmly with the hand, then to so conduct the manipulations as to return the body from above downward.

Noeggerath's method consists in pushing alternately from side to side, thereby delivering one horn at a time.

There is danger in prolonged taxis, hence judgment should be exercised in determining the time limit in its employment. Recurrence should be guarded against by packing the uterus with antiseptic gauze, which may be removed at the end of twenty-four hours.

When submucous tumors are associated with inversion, it is rare that the fundus fails to return to its normal position after enucleation of the tumor growth.

Fig. 230

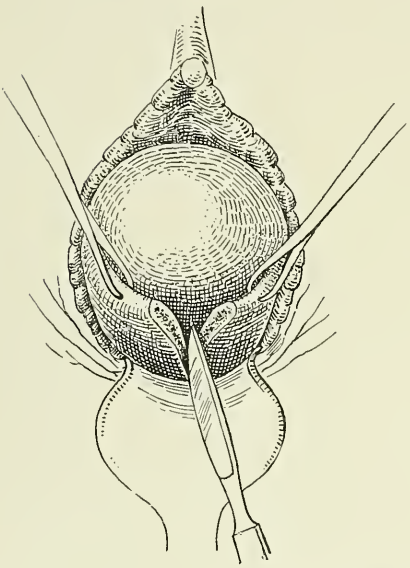
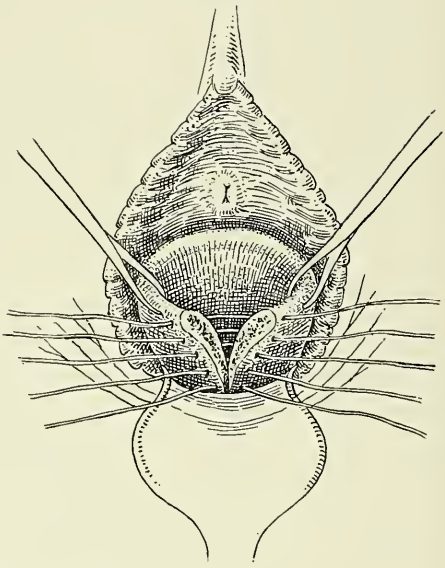


Fig. 231



Reduction of an inverted uterus. Modified from Ashton.

The cervical rim is grasped by bullet forceps and a median incision made through the cervical rim, of sufficient length to permit of the reduction of the fundus.

Interrupted sutures of No. 2 chromic catgut are placed in the cervical incision. These are tied and the cavity of the uterus, cervix, and vagina are packed with iodoform gauze.

Long-standing cases of inversion are rarely corrected by taxis, and, as a rule, demand operative interference.

In these cases it is well to first try manual reduction, but failing in this, operative means should be resorted to. Since injury may be done by prolonging the efforts at taxis, no time should be wasted on mechanical devices which were recommended in the past years.

Operations Devised for the Correction of Inversion of the Uterus.—*Dilatation and Incision of the Constricting Ring, followed by Manual Replacement of the Fundus.*—This method is the operation of choice

when it can be effectively carried out. The effort should first be to dilate the constricting ring, and failing to do so to a degree that will permit of reduction of the fundus by taxis, the ring should be incised on either side. Following the reduction of the fundus, the uterus is packed with gauze and the incision in the ring closed with chromic catgut.

Fig. 232

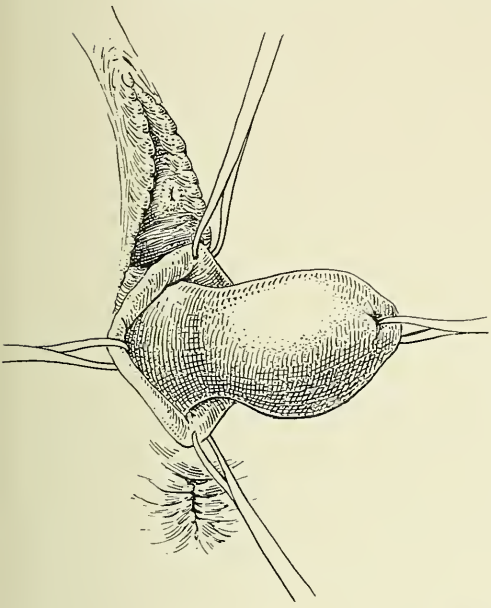
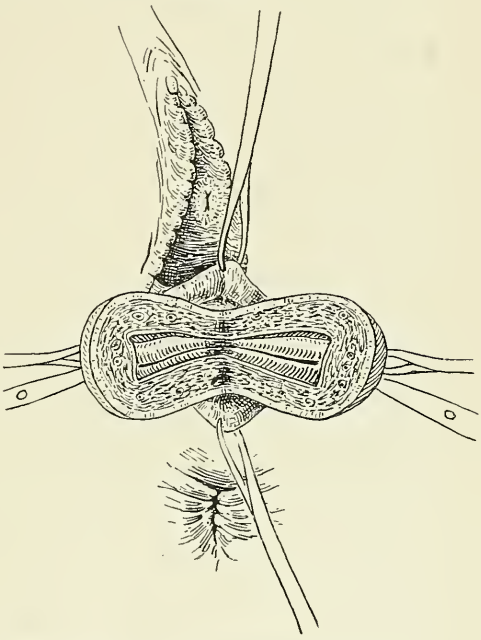


Fig. 233



Amputation of the inverted fundus.

Bullet forceps are made to grasp the fundus and cervical rim.

The body of the uterus is divided into two lateral halves as far as the internal os. Traction is made outward on either half by means of bullet forceps.

The operation devised by Küstner consists of the following steps:

Step 1.—A wide transverse incision is made through the cul-de-sac of Douglas into the peritoneal cavity.

Step 2.—The finger is inserted into the inversion funnel of the uterus and all adhesions are severed.

Step 3.—A median incision is made through the posterior wall of the uterus. This incision extends from a point about 2 cm. below the inverted fundus to a point 2 cm. above the external os.

Step 4.—The inverted fundus is replaced by pressure, with the thumb upon the fundus, while the funnel is steadied by the index finger inserted through the incision in the cul-de-sac of Douglas.

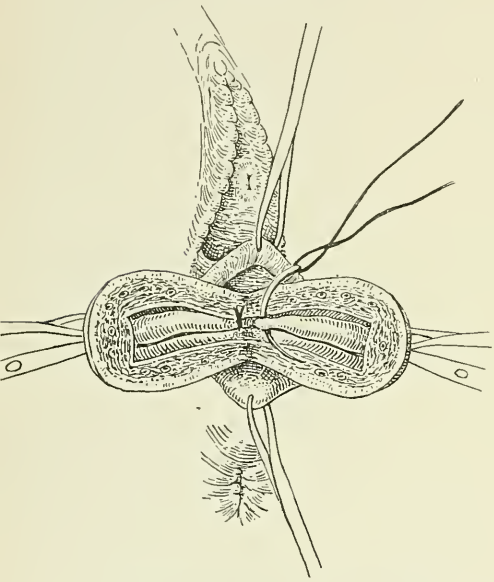
Step 5.—After replacing the fundus the uterine incision is sutured in two layers passed on the peritoneal side.

Step 6.—The cul-de-sac of Douglas is closed with sutures.

A preëxisting infection may render such conservative operations as the above dangerous. In such an event, when taxis fails to reduce the inversion, the uterus should be removed by the vaginal route.

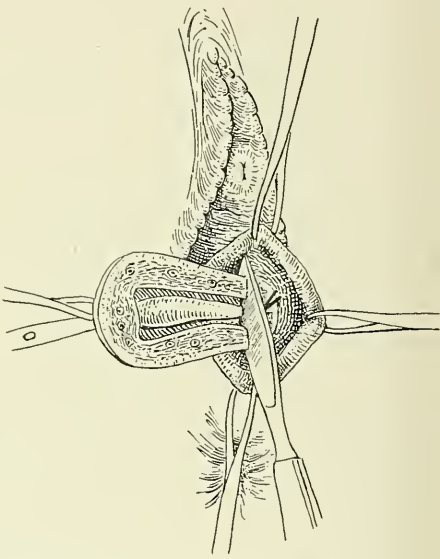
Vaginal Amputation of the Uterus.—Traction is made upon the inverted fundus by the gloved hand. The constricting ring is exposed by a posterior and two lateral retractors. The constricting ring is incised deeply anteriorly and posteriorly. Three stout, silk ligatures are passed from before backward, transfixing the stump of the uterus at a point below the constricting ring.

Fig. 234



The broad ligament and tube are ligated on either side.

Fig. 235



Either half of the inverted uterus is amputated at the internal os and transverse sutures of chromic catgut are placed in the cervical stump.

The peritoneum is now opened in front and behind and the uterine arteries ligated with plain catgut No. 3.

The amputation is made with a knife immediately below the transfixation sutures. These sutures must be firmly held by an assistant while the amputation is made to prevent the stump from retracting. The ligatures are tied after the amputation is completed and additional sutures are placed, if required. The stump is then allowed to retract through the cervix.

The vagina is packed with iodoform gauze, which may be removed at the end of forty-eight hours.

Vaginal Panhysterectomy.—It is seldom necessary to remove the entire uterus, but when malignant tumor formations complicate the inversion this radical measure is imperative.

The peritoneum is opened before and behind the constricting ring; a series of ligatures is then passed from below upward on one side and then the other, cutting close to the uterus.

It may be possible to close the peritoneum with a running catgut suture, after drawing the broad ligaments down on either side and transfixing them in the vault of the vagina.

The vagina is packed with iodoform gauze after insuring perfect control of all bleeding points.

Fig. 236

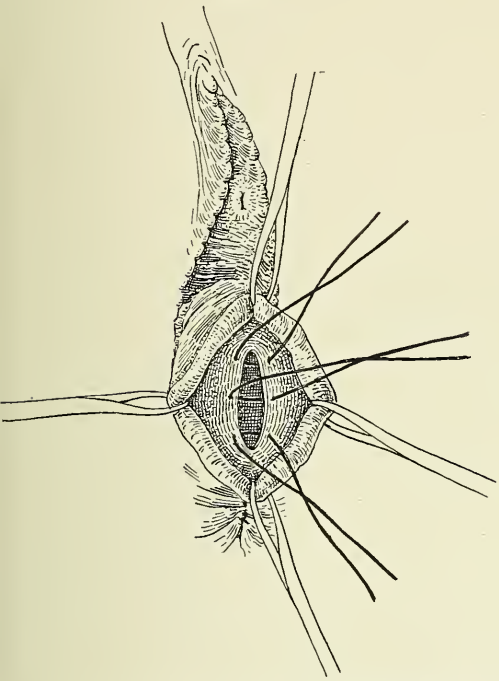
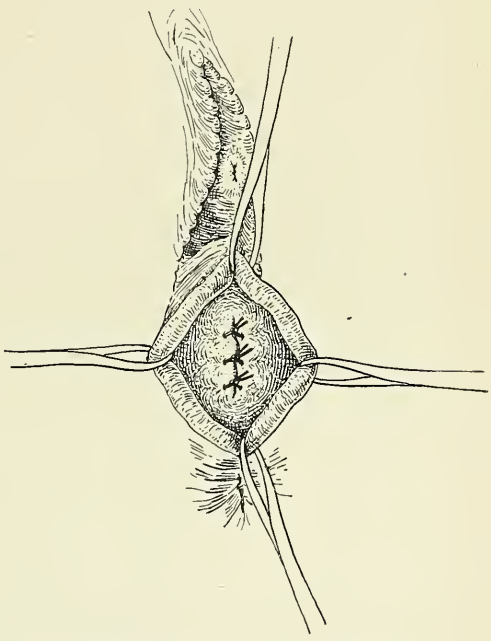


Fig. 237



Vaginal amputation of the uterus.

Fig. 236. The fundus is amputated and the sutures in the cervical stump are in place.

Fig. 237. The sutures in the cervical stump are tied.

Prognosis.—In acute inversion death may result from hemorrhage, shock, or sepsis. When the inversion is reduced early the outlook is favorable, but when reduced late there is little chance of subsequent childbearing because of the altered mucosa of the uterus and tubes.

Anteversion.—No sharp distinction can be drawn between a physiological and a pathological anteversion of the uterus. Within perfectly normal limits the long axis of the uterus is turned forward upon an imaginary transverse axis. A permanent exaggeration of this condition may be regarded as pathological.

Etiology.—An exaggerated temporary and physiological anteversion is found when the rectum is distended and the bladder empty, and also in the early months of pregnancy.

Chronic metritis is the most common cause of acquired pathological anteversion. The increased weight of the uterus causes the body to fall forward, the cervix to turn backward.

Contraction of the uterosacral ligaments from a retro-uterine cellulitis will draw the cervix backward and tilt the body forward. Here retroposition is commonly associated with anteversion.

More rarely adhesions bind the anterior surface of the uterus to the bladder or abdominal wall.

Any swelling behind the uterus may exert pressure upon the uterus in a manner that will produce an anteversion.

A mural fibroid located in the anterior wall of the uterus may cause the uterus to revolve forward by increasing the weight of the body.

FIG. 238

Anteversion of the uterus. The cervix points backward to the sacrum, the body forward upon the bladder and anterior vaginal wall. The long axis of the uterus is straight.

Diagnosis.—The diagnosis is made by a conjoined examination. The cervix points backward, or backward and upward, and the body is palpated through the anterior wall of the vagina, lying well upon the bladder and behind the symphysis. So extreme may the version be that the body may press down upon the anterior vault of the vagina, forming a rounded swelling not unlike a cystocele in appearance. In such a case the external os will be difficult to touch with the examining finger.

When for any reason the position of the uterus cannot be located by a conjoined examination, the sound will determine the direction of the uterine canal.

There are no characteristic symptoms. Frequent urination is the most constant complaint. When other symptoms exist they are usually caused by complications rather than by simple displacement.

After locating the uterus in anteversion, the next step is to determine the cause of the displacement (Fig. 238).

Treatment.—In uncomplicated anteversion of the uterus no treatment is called for. When complicating lesions are found, such as are classed above as causal factors, they should be given due consideration and not infrequently call for operative interference.

Anteflexion.—As with anteversion so with anteflexion of the uterus, it is not possible to draw a line between the normal and the abnormal positions. In anteflexion the uterus is bent forward upon its long axis.

Symptoms.—The subjective signs of anteflexion of the uterus are frequent urination, dysmenorrhea, and sterility, though these are by no means constant. It is not likely, as is generally believed, that dysmenorrhea is due to obstruction to the outflow of the menstrual blood. The angle of flexion can scarcely be so acute as to interfere with the outflow of blood. The explanation probably lies in the accompanying inflammatory lesions in and about the uterus and possibly also in spasmodic contractions of the internal os. Sterility can probably be accounted for by the accompanying inflammatory lesions rather than by the flexion. When the cervix points well forward the spermatozoa cannot so readily gain access to the cervix as when it is directed toward the posterior wall of the vagina.

Diagnosis.—In an abdominovaginal examination, the body of the uterus should be engaged between the two hands and the angle of flexion felt by the finger within the vagina. When the anteflexed uterus lies in retroposition, the flexion may be best found by the finger high in the rectum, feeling the angle upon the posterior surface of the uterus as the body bends forward upon the cervix. This examination will be materially facilitated by an anesthetic. The sound will be of special service when it is otherwise impossible to outline the uterus because of tumors and inflammatory exudates encroaching upon it. The size, shape, and consistency of the uterus will usually serve to distinguish it from all such swellings.

Having determined the position of the uterus, and before any treatment is proposed, it is essential to clearly define the cause of the displacement. Is the uterus fixed or free and movable? If free and movable, the fault may be a hypoplasia of the uterine wall at the point of flexion, and is, in all probability, a congenital defect. Here the uterus is often found to be undersized (hypoplasia). If the uterus is restricted in its movements, the cause may be a congenital or an acquired shortening of the uterosacral ligaments; new-formations or exudates lying behind the body of the uterus and crowding it

forward; or less frequently, the explanation may be found in an increase in the weight of the body of the uterus.

An intramural fibroid lying in the anterior wall of the uterus may form an angle with the cervix, which to the examining finger resembles an anteflexion. The form and consistency of the tumor, together with the passage of the sound, will locate the uterus apart from the tumor (Fig. 239). Anteversion and anteflexion are frequently combined.

Fig. 239

Uterine fibroid resembling anteflexion of the uterus. The uterus is bent forward upon its long axis. There is little alteration from the normal. A subperitoneal fibroid on the anterior wall forms a sharp angle, resembling an anteflexed uterus.

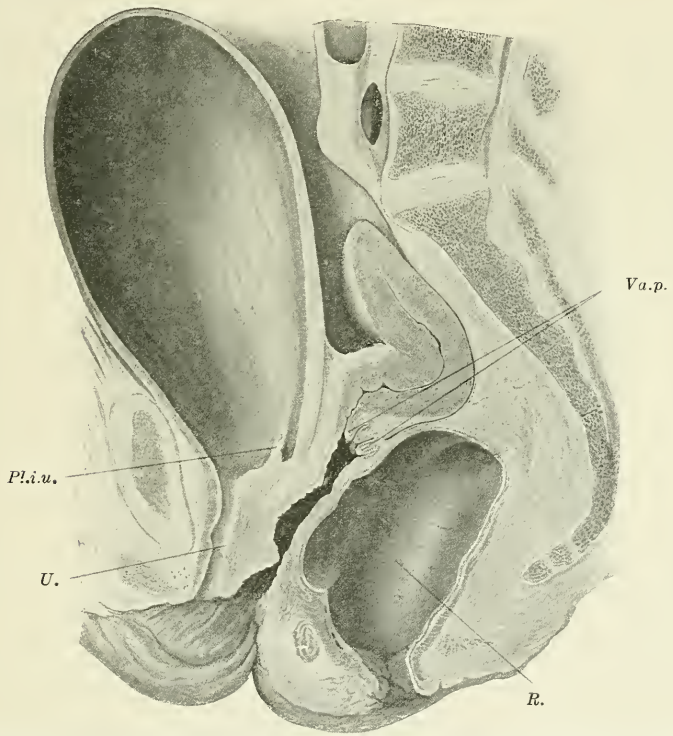
Treatment.—An uncomplicated pathological anteflexion of the uterus may demand operative interference, but never topical applications. The author condemns the pernicious practice of passing sounds into the uterus, of introducing stem pessaries, and the so-styled anteflexion pessaries. They can serve no good purpose and are capable of much harm.

In anteflexion, as in all displacements of the uterus, the treatment should be primarily directed, so far as possible, toward the removal of the exciting cause; hence it follows that the treatment, if it is to be effective, must vary with existing complications. Tumors lying behind the uterus are to be removed; inflammatory lesions demand topical and operative treatment; and a chronic inflammation or subinvolu-

tion of the uterus must be treated along conservative lines if relief is to be obtained.

Dilatation of the Cervix.—There is but one method of procedure that is generally adopted for the correction of a pathological anteflexion. This consists in forcibly dilating the cervical canal under anesthesia. For this purpose the author prefers Hegar's graduated bougies, and to consume ten to fifteen minutes in the operation. By this deliberate process a No. 14 bougie should be passed without tearing the cervix. Traction made upon the cervix by a vulsellum forceps will aid in straightening out the cervical canal. To prevent the accidental puncture of the uterus the body is first located by a bimanual examination, and the direction of the cervical canal and uterine cavity

FIG. 240



Prolapse of the anterior and posterior vaginal walls. Partial prolapse of the uterus. Uterus anteflexed and prolapsus partially corrected by distended bladder and rectum. *Pl.i.u.*, uterine ligament; *U*, urethra; *R*, rectum; *Va.p.*, vaginal fornix. (Tandler and Halban.)

further determined by the passage of a uterine sound. The author has found the operation facilitated by dipping the ends of the bougies in sterile glycerin. To prevent the bougies from suddenly slipping too far into the uterus and possibly perforating it, the forefinger should be placed about one inch from the end of the bougie as it is being forced through the cervical canal. (See Fig. 53.)

The author has frequently resorted to the use of an instrument of divulsion (Ellinger, Goodell) to supplement the bougies when there

Fig. 241

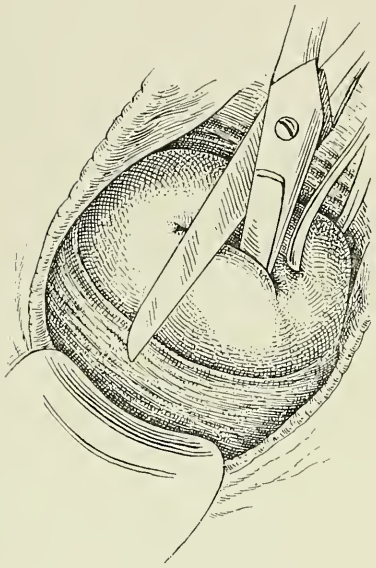


Fig. 242

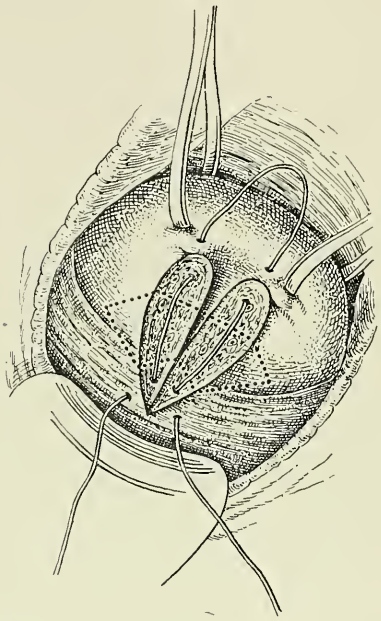
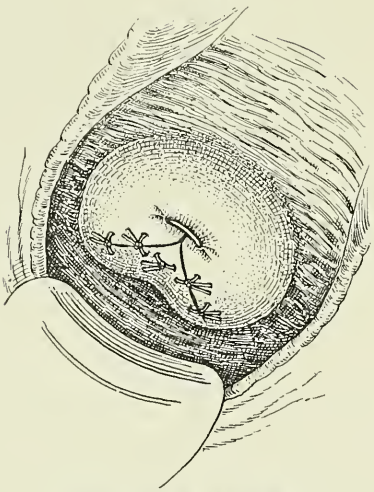


Fig. 243

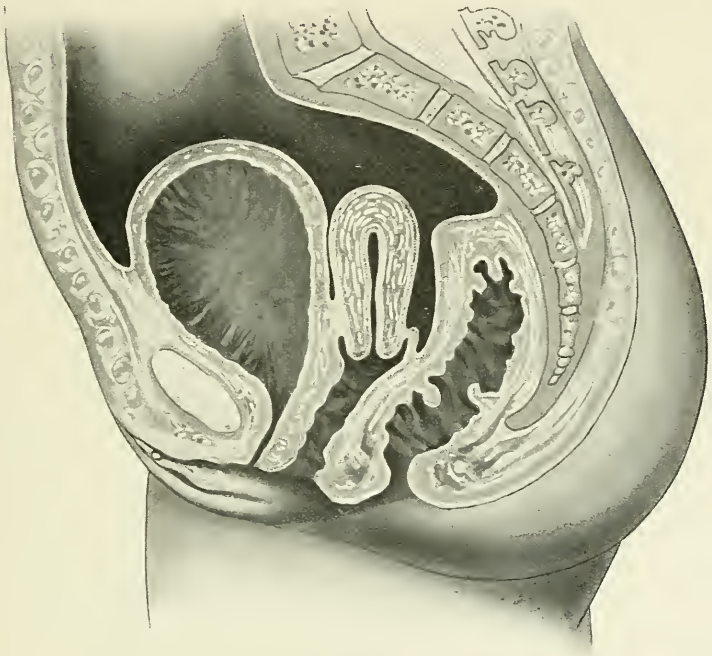


Dudley operation for anteflexion.

are great difficulties encountered. In no case has he found it necessary to incise the internal os with a bistoury passed into the cervical canal. Time and patience will usually overcome these obstacles.

After thoroughly dilating the cervix, the uterus is curetted and swabbed with pure formalin or equal parts of the tincture of iodine and pure carbolic acid. Some authors advise the packing of the uterus with antiseptic gauze; others prefer to introduce a glass stem pessary. These procedures the author has never adopted. The patient should be confined to bed for a week after the operation.

Fig. 244



Retroposition and retroversion of the uterus. The distended bladder crowds the uterus backward into retroversion and retroposition. When the bladder is empty the uterus will fall forward into anteversion and anteposition.

Dudley's Operation.—The Dudley operation for anteflexion has been received with favor as a method of treatment for exaggerated cases. The following is Dudley's description of the operation:

Step 1. The cervix is dilated to a moderate degree and the uterus curetted.

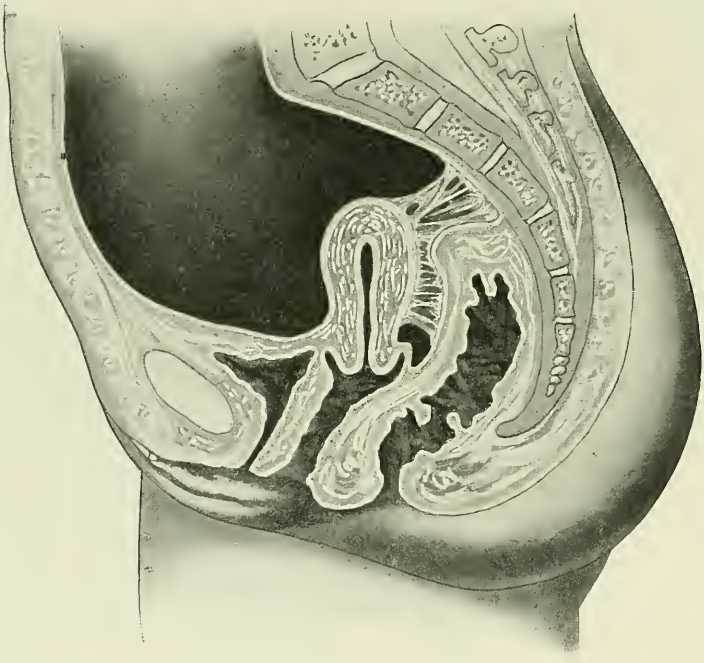
Step 2.—The anterior lip of the cervix is grasped with a vulsellum forceps and traction made downward and forward. A median incision is made with scissors through the posterior wall of the cervix to a point beyond the uterovaginal attachment and nearly to the utero-peritoneal fold in the pouch of Douglas (Fig. 241).

Step 3.—An assistant grasps the divided surfaces with tenacula and separates them widely, while the operator cuts out a small angle on

either side as shown in Fig. 242. The cut surfaces are then folded upon themselves by a single silkworm-gut suture as shown in Fig. 243. Additional interrupted sutures are passed for further security. In this manner each cut surface is folded upon itself from before backward. This directs the external os backward to the angle of the incision and turns the cervix to the hollow of the sacrum.

Retroversioflexion.—In retroversion the long axis of the uterus revolves backward upon an imaginary transverse axis. Such a position is physiological when the bladder is full and the rectum empty, the patient lying on her back.

Fig. 245



Retroposition and retroversion of the uterus, with fixation. Peritoneal adhesions bind the posterior surface of the uterus to the sacrum and rectum, holding the uterus firmly in retroversion and retroposition.

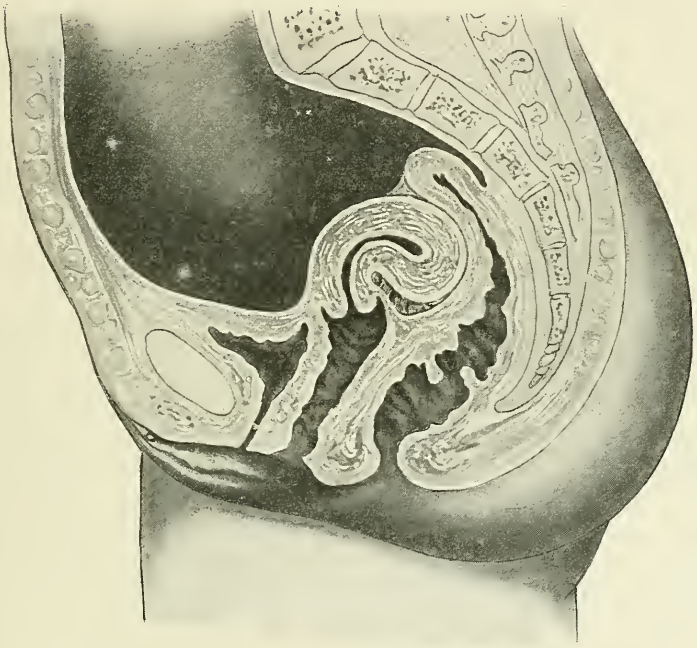
In retroflexion the uterus is bent backward upon its long axis. There is no physiological retroflexion of the uterus.

The two positions, retroversion and retroflexion, are caused by the same factors, and are commonly combined; retroflexion following retroversion. Because of their intimate association they will be discussed together. In virgins and in chronic metritis the uterus is seldom flexed, but remains in retroversion rather than in retroversioflexion (Fig. 245).

Etiology.—Schultze gives five causes for retroversioflexion, namely:

1. Failure in development.
2. Fixation of the portio vaginalis on the anterior pelvic wall.
3. Unilateral posterior fixation of the cervix.
4. Shortening of the posterior or lengthening of the anterior uterine wall.
5. Relaxation of the supporting uterine ligaments and muscles.

Fig. 246



Retroversioflexion of the uterus, with adhesions. The body is adherent in the cul-de-sac. The long axis of the uterus is bent backward and the cervix is directed downward.

1. Among the developmental failures contributing to retroversioflexion may be mentioned the proportionately long cervix and short vagina. In the presence of such a condition, an increase in the abdominal tension or a sudden fall would be sufficient cause for a retroversioflexion.

2. Fixation of the portio vaginalis upon the anterior pelvic wall may be the result of cicatricial contraction of the anterior wall of the vagina. Hence it is that retroversioflexion is frequently found in large vesico-vaginal fistulæ and in stenosis of the vagina.

3. Unilateral posterior fixation of the cervix occurs in about 6 per cent. of all cases of retroversioflexion (Schultze). The cause is retro-uterine cellulitis or peritonitis, more often confined to one sacro-uterine ligament.

4. Shortening of the posterior wall or lengthening of the anterior wall of the uterus is a rare finding.

5. Relaxation of the supporting uterine ligaments and muscles is by far the most frequent cause of retroversioflexion. When these supports are weakened, the long axis of the uterus first revolves backward upon an imaginary transverse axis (retroversion), and later, through the force of intra-abdominal pressure, the long axis of the uterus is bent upon itself (retroflexion). The stretching and tearing of childbirth largely account for the relaxation of the supporting

FIG. 247

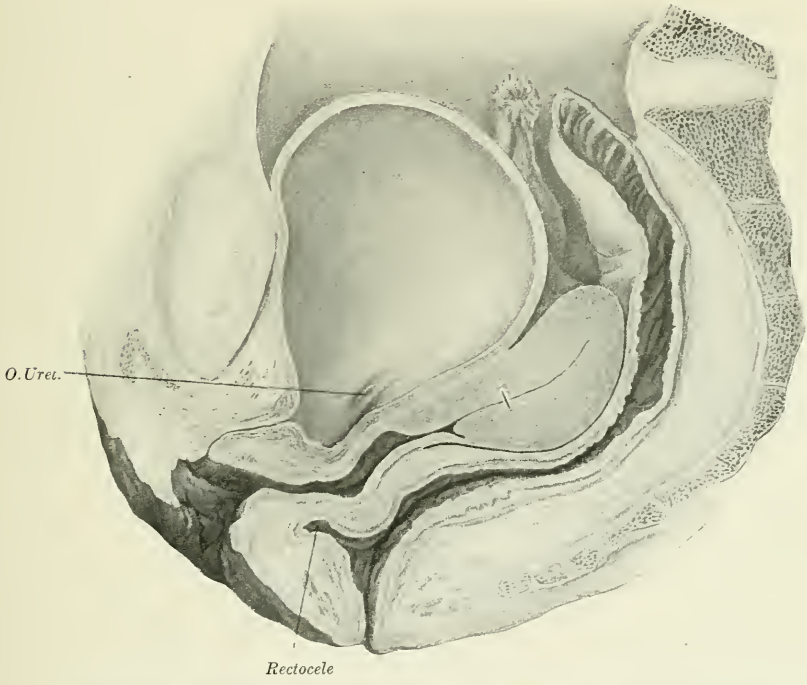
Incarcerated subperitoneal fibroid on the posterior wall of the uterus. The fibroid may be confounded with the body of the uterus. The uterus lies in retroversioflexion.

uterine ligaments and muscles. Retroversioflexion due to violent exertion or to a fall is difficult to establish, though not impossible. The cause of retrodisplacements of the uterus in the nullipara is difficult of explanation in the absence of swellings crowding the uterus backward or adhesions pulling it backward. Tight-lacing and habitual overfilling of the bladder will account for a limited number of these cases. Not a few are congenital, as is shown by anatomical dissections of infants. Salin found as many nulliparæ as multiparæ with retroversioflexion. He estimates the frequency of this displacement in all cases at 18 per cent.

Heredity probably plays no rôle, though mother and daughters are often similarly affected.

During the puerperium, when the uterus is large and soft, the ligaments relaxed, and the patient lying on her back, all the conditions favoring retroversion are present. This retroversion may go on to the development of a retroflexion through the influence of intra-abdominal pressure. Rising too early from childbed favors malpositions, as well as does lying too long in the dorsal position. It is for the purpose of avoiding such malpositions that the patient is instructed to lie in bed until the uterus and ligaments are well contracted and retracted. It is obvious that the patient should not lie constantly in the dorsal position, but should from time to time assume the knee-chest position, or at least lie upon the side or face.

Fig. 248



Retroversion of uterus. Beginning cystocele and rectocele. *O.Uret.*, ureteral opening. (Tandler and Halban.)

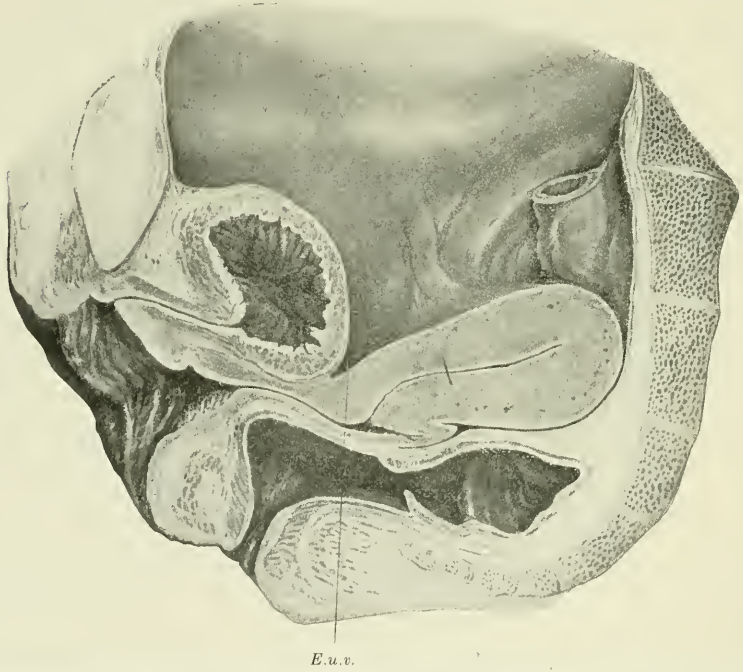
As to the frequency of retrodeviations of the uterus, the statistics of Winckel, Löhlen, and Sänger show an average of 17.74 per cent. of all gynecological cases (Reed).

Anatomical Diagnosis.—When the cervix is crowded forward the anterior vaginal wall is relaxed, while the posterior wall is taut. In retroversion the cervix points forward or forward and upward,

sometimes lying above the level of the symphysis. In retroflexion the cervix is directed downward and backward. When the body of the uterus lies in the hollow of the sacrum, the cervix must necessarily lie well forward to the symphysis. If, as is often found, retroversioflexion is associated with descensus uteri, the cervix may be elongated. If a bilateral laceration of the cervix is present, the vaginal walls will draw the lips of the cervix wide apart, exposing the mucous membrane of the cervical canal.

In retroversion the body of the uterus approaches the promontory, and may be found low in the pouch of Douglas. There is no angle of flexion between the body and cervix. The cervix and body lie in a straight line. In retroflexion the body may form an acute angle with the cervix. Often the uterus in retroversioflexion inclines to the left or right, and in extreme cases is almost invariably more or less prolapsed.

FIG. 249



Retroversion of the uterus. Prolapse of the entire bladder. Deepening of the vesico-uterine pouch. *E.u.v.*, vesico-uterine pouch. (Tandler and Halban.)

Edema and passive congestion, leading to hyperplasia of the endometrium and myometrium, are the almost inevitable results of the displacement. We, therefore, find endometritis and metritis associated with long-standing retroversioflexion. Frequently diffuse peritoneal adhesions bind the uterus, tubes, ovaries, and bowel together. The tubes and ovaries lie at a low level and suffer congestion and hyper-

plastic changes, leading to catarrhal salpingitis, chronic ovaritis, and cystic degeneration of the ovaries.

The bladder may be directly pressed upon by the cervix, causing frequent urination. In the retroflexed, gravid uterus there may be retention of urine.

The rectum is compressed, and may be obstructed by the body of the uterus.

Clinical Diagnosis.—The great number of cases of retroversioflexion in which no symptoms are present speak for the unreliability of subjective signs. Wormser asserts that uncomplicated cases of retroflexion in healthy women produce no symptoms. When disturbances exist, some local complication must be present, or there is a deranged nervous system. E. Schroeder reports 411 cases examined, in which 188 (28.7 per cent.) had retroversioflexion of the uterus, and of this number 25 per cent. were free from symptoms. He reasons that uncomplicated retrodisplacements of the uterus cause no symptoms; that those so frequently ascribed to such displacements are due to complicating lesions. Yet we often find extensive adhesions fixing the uterus in malpositions without causing either local or general disturbances. On the other hand, the disappearance of local disturbances immediately upon the correction of a non-complicated displacement cannot be wholly explained on the ground of suggestive treatment.

Menstrual Irregularities.—Menstrual irregularities are common, and usually take the form of an increase in the menstrual flow. This is explained by the passive congestion of the uterus. Extreme anemia may result from the loss of menstrual blood. The menopause may be delayed because of the passive congestion. During pregnancy and the period of lactation, occasional hemorrhages can be similarly accounted for.

Abortion.—The habit of abortion is in many instances explained by the uterine congestion.

Leucorrhea.—Leucorrhea, in the form of a hypersecretion of the glands of the uterus, is almost invariably present, and is caused by passive congestion of the uterus.

The congested uterus is a favorable nidus for microörganisms, and so it happens that the glandular secretion is often mixed with pus and microörganisms.

Dysmenorrhea.—Dysmenorrhea of the so-called congestive type is seldom absent. It is not probable that the menstrual flow is obstructed at the point of flexion. The occurrence of pain may be explained by the addition of the menstrual congestion to the already engorged uterus.

Sterility.—Sterility is a not uncommon result of retroversioflexion of the uterus. The incapacity for childbearing should be credited not so much, if at all, to the flexion of the uterus, as to the inaccessibility of the cervix to spermatozoa when it is crowded forward and upward, to changes in the endometrium, and to complicating lesions in the adnexæ and perimetrium.

Disturbances of Bladder and Rectum.—Disturbances of the functions of the bladder and rectum are accounted for by direct pressure.

Pain.—Pain in the pelvis referred to the groin, thighs, and back is the most constant of the subjective signs, but cannot be regarded as of great importance from a diagnostic standpoint, because pain is not an invariable symptom and does not differ from that caused by other lesions of the pelvic viscera. Backache is a common complaint, and is referred to the coccyx (coccygodynia), to the lumbar region, or to the area between the scapulæ; rarely to the cervical region. The absence of pain in many extreme retrodisplacements of the uterus suggests a doubt that the displaced uterus *per se* is the cause of the pain. Certainly the accompanying lesions, such as ovaritis, salpingitis, and perimetritis, account in large measure for the pain. Pressure upon the sacral plexus of nerves is often the explanation for the pain referred to the thighs, and since the uterus is rarely found in the median line, these referred pains in the lower extremities are for the most part unilateral.

Reflex Symptoms.—Reflex symptoms, such as headache, neuralgia, dyspepsia, hysteria, and neurasthenia, are often attributed to the displacement, but it seems impossible to demonstrate such to be a fact with any degree of positiveness.

It is clear that a diagnosis cannot be based upon the subjective signs. Too many cases exist in their absence, and the complaints of the patient are those found in almost any of the lesions of the pelvis. A physical examination is therefore required to establish a diagnosis. A diagnosis includes not only the location of the uterus, but also the condition of the adnexæ and neighboring structures. Here, as in the diagnosis of all displacements of the uterus, it is first necessary to locate the uterus, and, second, to determine the underlying cause of the displacement and the existence of complicating lesions within the pelvis and abdominal cavity.

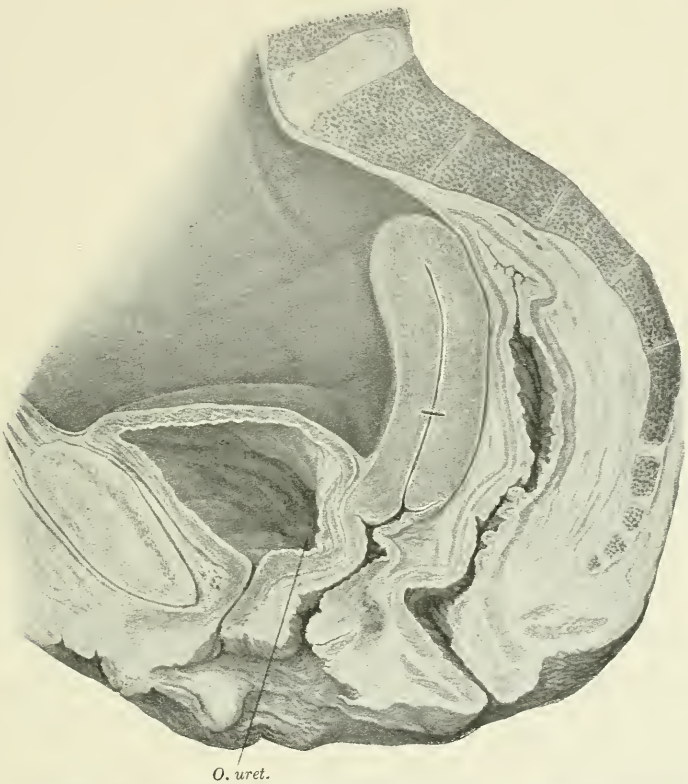
In making a bimanual examination the position of the vaginal portion of the cervix may be an indication of the position of the uterine body. For example, if the cervix lies in its normal position, pointing downward and backward toward the second sacral vertebræ, the body must lie in the normal position or retroflexed; it would be impossible for a retroversion to exist with the cervix pointing downward and backward. If the cervix lies in front of its normal position and points directly downward, one of two positions is present, a retroflexion or an anteposition. It is sometimes possible to recognize a retroflexion in a simple vaginal palpation by feeling the angle of flexion through the posterior fornix. When conditions are not favorable, a positive diagnosis of the position of the uterus can only be made by a conjoined examination under anesthesia.

A recto-abdominal or rectovagino-abdominal examination affords better means of palpating the uterus when lying far back against the rectum.

The use of the sound should be restricted, but it is occasionally called into service when a bimanual examination will not suffice.

Is the uterus fixed or movable? First of all we must have clearly in mind what constitutes normal mobility of the uterus. It is not enough that the uterus should permit the usual excursions when manipulated, but it must return to its normal position when pressed out of place. Failing to do so constitutes a pathological condition.

Fig. 250



Retroversion and descensus uteri. Beginning cystocele. *O. uret.*, ureteral opening. (Leipmann.)

The fixity of the uterus is determined by the effort to replace it. Sensitiveness and thickness of the abdominal wall may render an anesthetic necessary.

The technic of replacing a uterus in retroversioflexion is briefly outlined as follows:

The bladder and rectum are empty. The patient lies in the lithotomy position. One, and where possible without causing pain, two fingers are inserted into the posterior vaginal fornix, and moderate, steady pressure is made upon the uterine body in an upward and forward direction. The

hand over the abdomen presses steadily in the effort to pass over and behind the fundus, as it is forced upward and forward by the fingers in the vagina. Sometimes the body will rotate forward by the finger pressing backward upon the cervix. With the middle finger in the rectum, it is possible to exercise more direct pressure upon the body of the uterus in extreme retroflexion. Traction upon the cervix by a tenaculum will bring the uterus more within reach of the fingers in the vagina and rectum. An anesthetic is usually advisable. Formerly, in reposition of the uterus, a sound was advised, but the danger of perforations is too great to justify its general use. Certain it is that the sound should not be used when the uterus is fixed. In replacing the uterus force must not be used for fear of tearing existing adhesions, causing hemorrhage and injuring adherent viscera.

Having determined the position of the uterus and the fact that it is not replaceable, it next becomes necessary to determine the cause of the inhibition. As possible causes may be mentioned adhesions and pelvic exudates, inflammatory contractions of the ligaments, and pelvic tumors. Peritonitic adhesions (peritonitis) for the most part arise from extension of infection through the tubes, and are most often found about the tubes and ovaries. Since infected tubes commonly lie in the cul-de-sac of Douglas, the surrounding adhesions may bind the uterus to the rectum in retroversion or retroflexion. Peritoneal adhesions are recognized by their location on surfaces covered with peritoneum and by the ease with which they may be broken up as compared with parametritic adhesions.

Parametritic adhesions correspond in location to the cellular tissue of the pelvis, which is found between the layers of the broad ligament, underneath the pouch of Douglas, and to a limited extent in front of the uterus beneath the vesico-uterine fold of peritoneum.

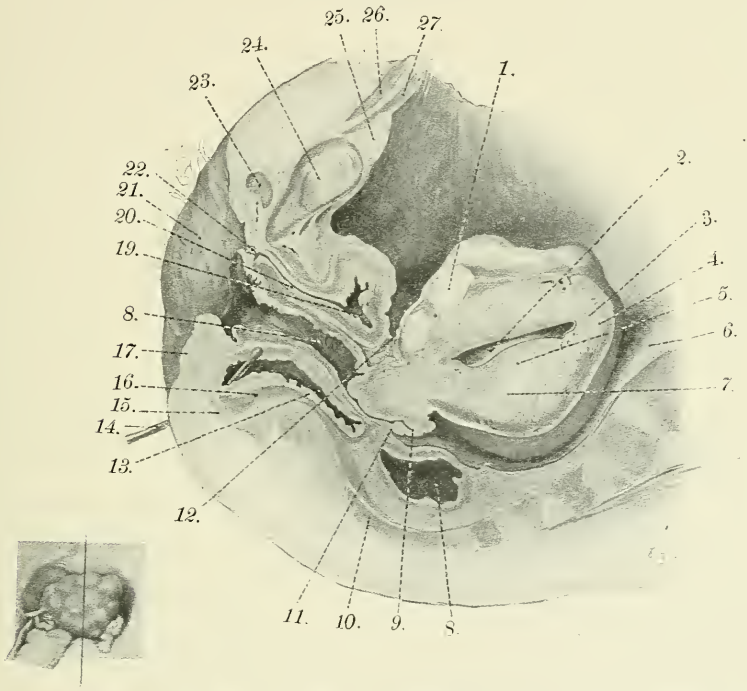
Retroversioflexion may be brought about by adhesions in the cellular tissue of the vesico-uterine space drawing the cervix forward and rotating the body backward—this, however, is quite unusual.

Retro-uterine parametritis, when involving only the supravaginal portion of the cervix, tends to produce an anteversion by drawing the cervix backward and rotating the body forward. In extreme cases the uterorectal fold of peritoneum may be crowded upward and permit the parametritic adhesions to adhere high up upon the posterior surface of the uterus, and, by traction upon the body, a retroversion is caused. Parametritic adhesions are thicker and firmer than they are in parametritis. They are found on a lower level, are more accessible through the vagina, and are located where the cellular tissue of the pelvis is found.

Pregnancy in a retroflexed uterus may prove a serious condition. No special difficulty may be experienced in the first two months, but in the third and fourth months the uterus, no longer able to accommodate itself to the small pelvis, is prevented from rising into the abdominal cavity. As a result pregnancy will be interrupted, or pressure symptoms will become increasingly severe and demand correction. On

bimanual examination the large, soft, and elastic uterus may be found to bulge into the posterior vaginal fornix even to the introitus. The cervix is forced high behind the symphysis, and is directed forward or forward and downward. The soft cervix and softer lower uterine segment may be felt to connect at an angle with the large, rounded, soft, and elastic body of the uterus. Because of the great softening the uterine body may appear detached from the cervix, and in case the cervix is hypertrophied, it may be mistaken for the entire uterus and the body may be thought to be a newgrowth.

FIG. 251



Myomatous uterus. Medial section of pelvis. 1, subserous fibroid; 2, cavity of uterus; 3, interstitial fibroid; 4, interstitial fibroid; 5, submucous fibroid; 6, promontory of sacrum; 7, interstitial fibroid; 8, rectum; 9, posterior vaginal fornix; 10, coccyx; 11, cul-de-sac of Douglas; 12, vesico-uterine fold or peritoneum; 13, rectum; 14, sound in rectum; 15, levator ani muscle; 16, internal sphincter ani; 17, perineum; 18, vagina; 19, urinary bladder; 20, urethra; 21, labium majus; 22, external orifice of urethra; 23, clitoris; 24, symphysis pubis; 25, cavum Retzii; 26, pyramidal muscle; 27, rectus abdominus. (Leipmann.)

Differential Diagnosis.—*From Retroposition.*—Retroversioflexion is most often confounded with retroposition. In the latter the cervix lies in the posterior segment of the pelvis, while in retroversioflexion it lies anterior to the normal position. In both conditions the body of the uterus lies far back in the pelvis, but in the latter the long axis of the uterus is no longer in the normal line of direction.

From Anteflexion.—Anteflexion may be mistaken for retroversion. The cervix points in the same direction—forward and downward—and the body may be small, and therefore overlooked or mistaken for the supravaginal portion of the cervix. If on bimanual examination the body of the uterus cannot be located a sound may be passed.

From a Fibroid.—A retro-uterine subperitoneal or interstitial fibroid may form an angle with the cervix that can be mistaken for the body flexed upon the cervix. The body of the uterus is recognized by its size, form, consistency, and direct relation to the cervix. Such a fibroid should present a circumscribed area of firmer consistency and produce an irregularity in the uterus. When the bimanual examination will not suffice for a diagnosis, the uterine sound may be used.

Swellings of the tubes and ovaries lying behind the uterus, retro-uterine hematoma and hematocele, and parametritic exudates are all to be differentiated from retroversioflexion by a consideration of the clinical history, and by finding a mass behind the uterus that differs in size, form, and consistency from the uterus, and which, by the use of the sound, is found to be separate from the uterus. For further discussion, see respective chapters on these subjects.

Treatment.—Do all cases of retroversioflexion of the uterus demand correction? In answer to this question, the author would say that in uncomplicated cases in which there are no disturbances referable to the displacement no operative interference should be advised. In view, however, of the possible development of tissue changes within the uterus and its adnexæ, which in time will almost surely give rise to functional disturbances, it would be well to correct the displacement by manual reduction and the application of a pessary. Such treatment can do no harm and may be the means of preventing future disorders which are so commonly the result of retroversioflexion of long standing.

Treatment of Acute Retroversioflexion.—When the displacement is known to exist less than one year, the treatment may proceed along conservative lines, with a reasonable assurance of success. After this time there is little hope of giving permanent relief by any means short of an operative procedure. The explanation lies in the condition of the uterine supports. If the uterus is early replaced and held in place, the supports which have been stretched and displaced may resume their normal position and tonicity. But through continual over-stretching there is little probability of their ever retracting to a degree sufficient to support the uterus in its normal position.

It is not advisable to persist for more than several months in the effort to restore a recent displacement; at the end of this time, if not successful, the condition must be regarded as chronic and not amenable to permanent correction by conservative methods. The treatment should then consist of:

Removal of the Cause.—The great majority of recent displacements follow abortions and childbearing at term. Not only are the ligaments stretched but the pelvic floor is commonly stretched and torn. Furthermore, the uterus is almost invariably subinvoluted. In such an event

the intra-abdominal pressure should be relieved by the wearing of an abdominal binder, and by regulating the bowels to prevent constipation with straining at stool. The position of the patient should be shifted from time to time from the back to the side and to the knee-chest position. Injuries to the cervix, vaginal walls, and pelvic floor should be repaired. When there is retained placental tissue it should be removed. An infected uterus should not be curetted but should be treated along rational conservative lines. (See page 439.) If the uterus is congested it should be depleted by vaginal packs and hot douches, and finally the uterine supports should be strengthened by intelligently conducted pelvic massage.

Replacement of the Uterus.—This should be effected after all complicating lesions, which would prevent ready and lasting replacement, have been removed. This may be accomplished by the bimanual method and by the knee-chest position.

Bimanual Method.—The index and middle fingers of the left hand are introduced into the vagina, back of the cervix, and are crowded forward upon the posterior wall of the cervix and body of the uterus as far as the vaginal wall will permit. In extreme cases the vulsellum forceps may be made to grasp the posterior lip of the cervix, by which the assistant may make traction upon the cervix. As a further aid the index finger is introduced into the vagina and the middle finger into the rectum. By means of the two fingers the fundus is pushed in the direction of the promontory of the sacrum. This method is especially valuable when the vaginal walls are unyielding.

When the fundus is brought to the level of the promontory of the sacrum, unless the abdominal walls are thick and tense, the fundus may be grasped by the fingers of the right hand, which depress the abdominal wall. When the fundus is under the control of the right hand the finger within the vagina is shifted to the anterior lip of the cervix and is made to push the cervix backward while the hand on the abdomen draws the uterus forward.

Knee-chest Position.—With a perfectly movable uterus, replacement to the normal position is often possible by placing the patient in the genu-pectoral position. Before assuming this posture, the waist binding should be loosened and the bladder and rectum empty. A firm table or couch is preferred and on it the patient assumes the knee-chest position. This consists in resting upon the chest and knees, the arms extended to the sides, and the side of the face resting on a low pillow. A Simon speculum with a curved blade is introduced into the vagina, and by it the perineum is retracted. The air balloons out the vagina, and the body of the uterus is assisted in the excursion by making traction upon the cervix with a vulsellum forceps. By bringing the uterus to a lower level the fundus may pass from under the promontory of the sacrum. Further aid may be given by pressing upon the body of the uterus from the posterior vaginal fornix with a ball of absorbent cotton placed upon a curved dressing forceps. When the uterus is fixed by adhesions, or firmly wedged in the hollow of the sacrum, failure is likely to ensue.

Retaining the Uterus in Position.—After replacing the uterus some means of support must be devised. In recent displacements conservative measures should be adopted. If tenderness exists as the result of congestion or an inflammatory lesion in the pelvis, the uterus may be temporarily supported by tampons of lambs' wool.

It is in recent displacements that the Hodge-Smith pessaries are of greatest service, but they are not to be worn when they occasion discomfort.

General Treatment.—Here, as in all pelvic disorders, it is essential that the condition of the general health must be looked to if good results are to be obtained.

Careful regulation of the diet, of the bowels, of exercise, and of rest are essential to all gynecological cases, and are to be conducted in accordance with the rules laid down in previous chapters.

An important factor for consideration is that of dress. The even distribution of the clothing over the body and the avoidance of waist constriction and traction are to be borne in mind. (See Chapter XII.) Stimulating baths should be employed daily. (See page 189.)

Treatment of Chronic Retroversioflexion.—In the treatment of chronic retrodisplacements of the uterus no permanent correction can be obtained by the conservative measures employed in the management of acute displacements. The uterus may be replaced by bimanual manipulations, but the displacement will promptly recur unless a suitable support is provided; again, the uterus may be retained in position by tampons or pessary, but recurrence will follow the withdrawal of the support.

It therefore follows that operative interference is demanded for the permanent correction of chronic retrodisplacements of the uterus.

The question may arise, Would you advise the application of the pessary in any case? The author's answer to this question would be that, in chronic displacements causing symptoms, his choice would be in favor of an operation unless contra-indicated by existing physical conditions, which would make the operation hazardous, or by the choice of the patient in favor of the pessary after full knowledge that the pessary can at best give only symptomatic relief so long as it is worn. The author favors operation in these cases because of the permanent and speedy results obtained, and because it affords opportunity for the correction of the causes and results of the lesion. In short, a condition of health may be thereby restored and by no other means.

In operating for displacements of the uterus the surgeon must bear in mind that the causal and resultant factors are, as a rule, of greater importance than the displacement. An uncomplicated retrodisplacement may not demand operative interference, but a retrodisplacement associated with relaxation of the uterine supports, with laceration of the cervix and pelvic floor, with tumor formations and with chronic inflammatory lesions, in the uterus and its adnexæ, do demand operative interference—not so much because of the displacement of the uterus, but more because of existing lesions which stand in relation to the displacement as causes or effects.

These coexisting lesions can be corrected along with the replacing of the uterus and under a single anesthesia.

No attempt will be made to describe the many operations designed for the correction of retroversioflexion of the uterus. A large number of them possess no merit and some of them are positively harmful. The author desires to present only those operations which in his judgment have the greatest merit.

Ventrosuspension.—Ventrosuspension of the uterus, once in general favor, is now generally supplanted by other equally effective and less objectionable operations upon the uterosacral and round ligaments.

Howard Kelly, who introduced this method of correcting a retroversioflexion of the uterus in 1886, still vigorously defends his method. Having performed more than one thousand ventrosuspensions, his conclusions deserve careful consideration.

Ventrosuspension of the uterus has been objected to because it substitutes a fixed, unnatural anteflexion for a retroflexion, because it crowds the uterus upon the bladder and interferes with its distension, and finally because it interfers with the normal development of the pregnant uterus.

Kelly answers these arguments by stating from his large experience that the actual fixation to the abdominal wall lasts but a short time, that within a few months the uterus lies at a distance from the abdominal wall in a position of easy anteflexion. In this position, he says, the suspension does not interfere with the distension of the bladder nor with the development of pregnancy. He argues that it is only when the uterus is firmly fixed to the abdominal wall, not suspended, that serious trouble arises.

The author performed ventrosuspension to the exclusion of all other methods prior to 1904. Since that time he has given preference to the round ligament operations described below. He has discriminated against the operation because of the frequency with which the suspension band has been known to so stretch as to permit of a recurrence of the displacement; because of the occasional dragging pains at the seat of the scar, and, more than all, because of the serious obstetrical complications which he believes follow to an unjustifiable degree. In view of the obstetrical complications which may follow this operation, the author is of the opinion that ventrosuspension should never be performed when there is a possibility of future childbearing. In this respect the operations upon the round ligaments have the advantage of creating no obstacle, even though they may be no more permanent in their results.

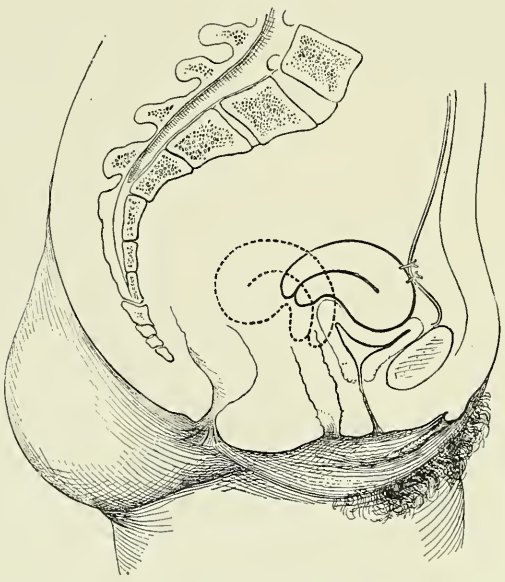
Technic of Ventrosuspension.—*Step* 1.—The usual median incision is made in the abdomen, having previously catheterized the bladder. This incision need not be longer than two inches unless required for the correction of other lesions.

Step 2.—The fundus is elevated by the index and middle fingers introduced through the incision. If the uterus is bound by adhesions these must be severed by the fingers or scissors. After freeing the

uterus, attention is directed to the appendages. These are dealt with according to the demands of existing lesions. Other lesions, such as a chronic appendicitis, are disposed of and the pelvis left free of all abnormalities before the uterus is suspended. After completing the work required in the pelvis the fundus is pushed forward under the symphysis to the position of anteflexion. This is done by the finger; no tenacula forceps are required.

Step 3.—With the posterior surface of the fundus directed toward the abdominal incision, a medium-sized silk suture in a round curved needle is passed through the peritoneum and subperitoneal connective tissue at a point near the lower end of the incision, then transfixes the fundus on its posterior surface to a depth of about one-eighth inch, and finally passes through the peritoneum and subperitoneal connective tissue of the opposite side and at a point corresponding to its entrance. The suture is then securely tied, avoiding too tight constriction, and bringing the peritoneal surfaces together in close proximity to the uterus at the point of transfixion.

FIG. 252



Suspension of the uterus. Diagram showing the position of the uterus in retroflexion in dotted line, and the position of the uterus held in anteflexion by the two suspensory sutures. Note the yielding of the peritoneum. (Kelly.)

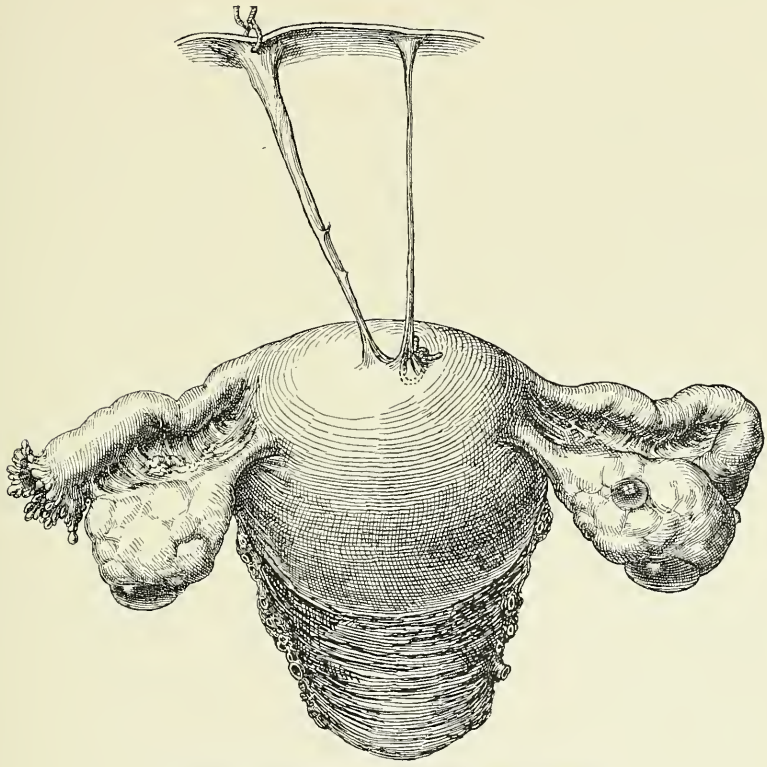
A second suture is similarly passed at a point one-half inch higher in the incision and transfixing the uterus a half-inch back of the first suture.

Step 4.—After tying the two sutures and cutting close to the knots a careful examination is made with the finger to make sure that no

loops of intestine or portion of omentum have become engaged between the uterus and the abdominal wall. The abdominal wall is then closed in the usual way.

Emphasis is placed upon the anteflexion of the uterus in order that the intra-abdominal pressure may be directed to the posterior surface of the uterus, thereby aiding in maintaining the uterus in its normal position. Were the uterus transfixed high upon the fundus in a line with the tubes the tendency would be for the intra-abdominal pressure to force the uterus downward and backward rather than forward.

FIG. 253



Adhesions stretched out to form new artificial ligaments.

AFTER-TREATMENT.—During the three or four days following the operation, the urine must be evacuated every three to six hours. No more than six ounces of urine should be permitted to accumulate in the bladder for fear of tearing out the sutures. During this time the catheter should be used only when the patient is unable to void the urine.

The patient should be allowed to change her position from side to side. After ten days of confinement in bed she may be permitted to sit in a chair and to walk about. Before doing so it is well to introduce a Hodge-Smith pessary, which should be worn for eight to twelve

weeks. Doubtless the wearing of the pessary will have its influence in preventing a recurrence of the displacement.

Precautions.—Kelly advises against the suspension of a pregnant uterus for fear of fixation resulting in a uterus which is growing so rapidly and is so vascular.

He also advises against the suspension of a uterus bleeding at the fundus from broken adhesions or from wounds made by tenacula forceps.

One more precaution is cited by Kelly, that of fixing the uterus low in the abdominal incision so that the uterus is not more than 3 or 4 cm. above the symphysis. When suspended at a high level anteflexion is not obtained and the intra-abdominal pressure tends to force the uterus backward.

Care should be taken not to wound the peritoneal covering of the fundus by forceps and tenacula for fear of the development of adhesions between the uterus and abdominal wall, thereby creating a fixation of the uterus. Failure to heed these precautions doubtless accounts for many of the unfortunate results obtained by surgeons.

While the author no longer practises the Kelly method of suspension, believing that other methods are preferable, he is free to recognize the merits of the operation in selected cases.

Ventrofixation.—The fixing of the uterus to the rectus muscles is an operation which should seldom be employed. It is not only objectionable when done in the childbearing period, but at all times it prohibits the physiological range of motion with which the uterus is normally endowed.

Ventrofixation of the uterus gives rise to the following difficulties in pregnancy and labor:

1. Retraction of the scar with pain.
2. Cervix displaced backward and upward.
3. Overdistension of the posterior wall of the uterus and the development of a tumorous mass in the anterior wall of the uterus, which may obstruct the passage of the child in labor.
4. Liability to the spontaneous interruption of pregnancy.
5. The term of pregnancy may be prolonged.

Difficulties Arising from Ventrofixation during Labor.

1. Ineffective uterine contractions due to the thinning of the posterior wall of the uterus.
2. Passage of the fetus obstructed by the tumorous mass in the anterior wall of the uterus.
3. Slow and imperfect dilatation of the cervix due to its displacement upward and backward.

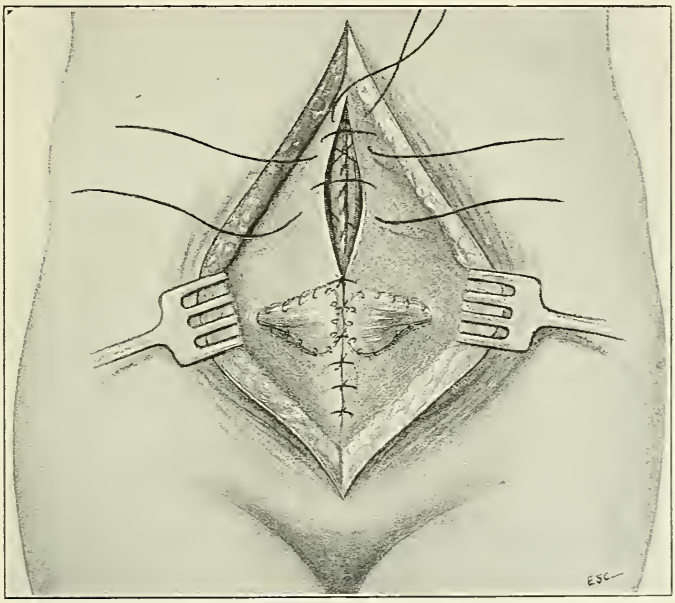
Todd-Gilliam Operation.—This, in the opinion of the author, is an excellent operation in all cases of retroversioflexion requiring operation. The results have been most satisfactory in more than one hundred cases of the author and the simplicity of the technic commends itself. There is no restriction in the mobility of the uterus, and no adhesive bands to give rise to intestinal obstruction. The uterus is suspended by

the strongest part of the round ligament, which is capable of much resistance. No complications in pregnancy are to be anticipated inasmuch as the uterine end of the round ligaments, which suspend the uterus, are capable of hypertrophy, of elongation as the uterus rises in the abdomen, and of retraction after delivery.

It is argued that the round ligaments, in their changed position, present two cords in the anterior segment of the pelvis which endanger the patient to intestinal strangulation. Theoretically the argument holds good but experience proves that the accident has seldom occurred.

To obviate this objection Frank F. Simpson has devised a modification of the Todd-Gilliam operation. (See page 376.)

Fig. 254



Loops of round ligaments stitched to the sheath of the recti muscles in the Todd-Gilliam operation

Technic of Todd-Gilliam Operation.—The following are the steps of the operation as practised by the author:

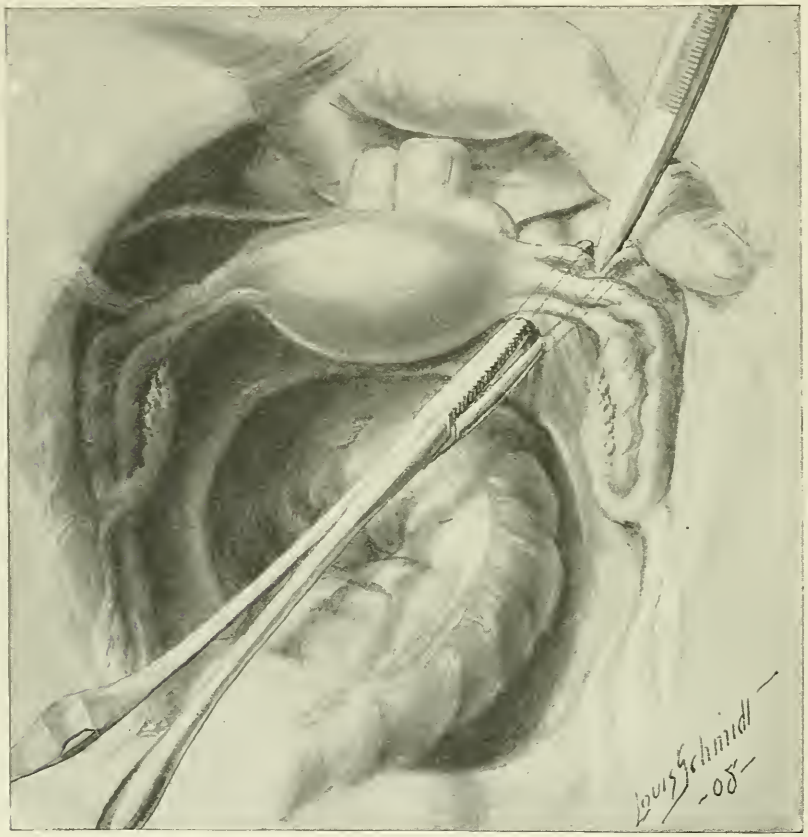
1. Median abdominal incision.
2. Reflect skin and subcutaneous fat from external sheath of the rectus at the lower end of the incision.
3. Button-hole external sheath with knife, one-half inch on each side at the lower angle of incision.
4. Force twelve-inch artery forceps of proper curve through sheath, rectus muscle, and peritoneum.
5. Grasp round ligament one inch from the cornua of uterus and withdraw the loop of ligament through the sheath of the rectus.
6. Repeat the same process on opposite side.

7. Close parietal peritoneum with a running suture of plain catgut No. 1.

8. Close sheath of rectus by interrupted ten-day chromicized catgut No. 2.

9. Spread loop of round ligaments over sheath of rectus and stitch margins with No. 2 plain catgut. Reinforce with one or more fixation sutures of silk or linen.

FIG. 255



The hemostatic forceps are seen perforating the broad ligament from behind to its anterior aspect on which lies the round ligament. A pair of tissue forceps are grasping the round ligament and carrying it into the bite of the perforating hemostatic forceps. (Baldy.)

10. Anchor round ligament at the point of exit through the sheath of the rectus with linen.

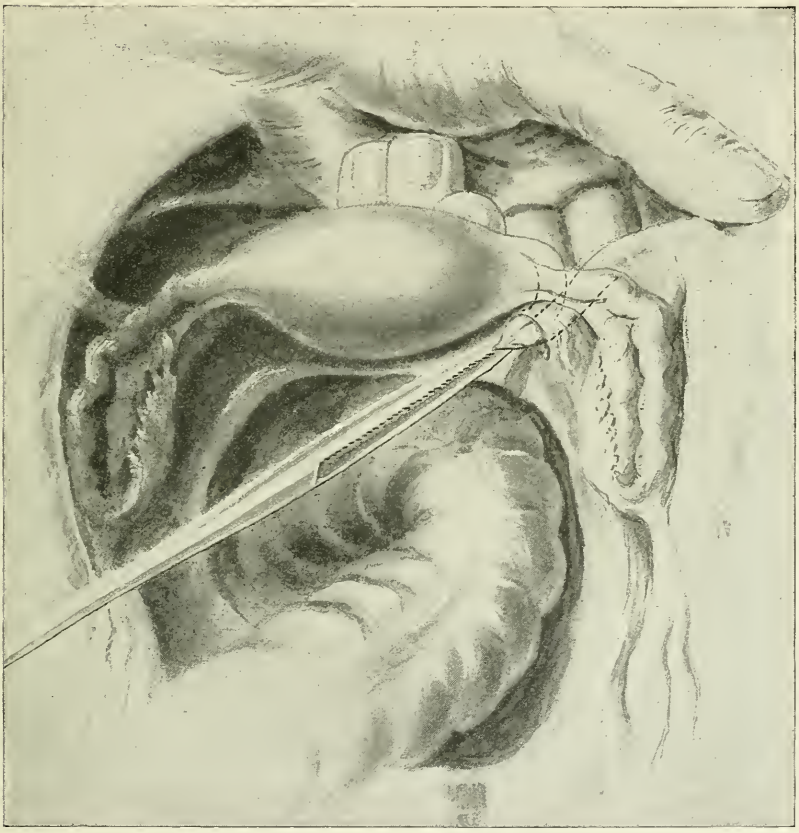
11. Close skin incision with a subcutaneous suture of silkworm-gut or horse-hair.

All lesions within the pelvis should be attended to before the above steps are taken.

The Gilliam operation is described in full in the *Jour. Amer. Med. Assoc.*, September 18, 1900. It will be noted that the author has made some modifications in technic, but the essential steps of the operation do not differ.

Retro-uterine Looping of the Round Ligaments.—Credit is due Webster and Baldy for introducing and perfecting this operation. The author has practised this operation with great satisfaction. It has

Fig. 256

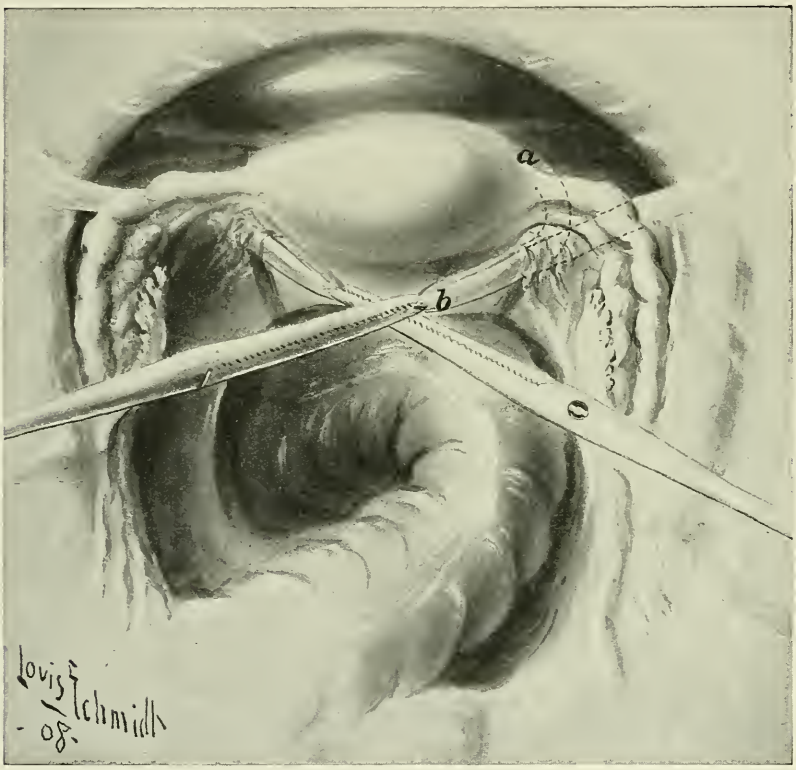


The round ligament in the grasp of the hemostatic forceps and in process of being drawn through the broad ligament to its posterior aspect. (Baldy.)

the advantage over the Todd-Gilliam operation in that the direction of traction made by the round ligaments does not differ essentially from the normal, but it suffers in comparison with the Todd-Gilliam operation, in that the weaker part of the round ligament is left to support the uterus.

Technic of Operation.—The usual abdominal incision is made in the median line. Before proceeding to correct the displacement of the uterus, all pathological conditions within the pelvis should be corrected. After completing this preliminary work the operator proceeds with the replacement of the uterus. The round ligaments are grasped by hemostatic forceps near the uterine cornua and the uterus is drawn forward to the pubes. Long hemostatic forceps are forced

Fig. 257

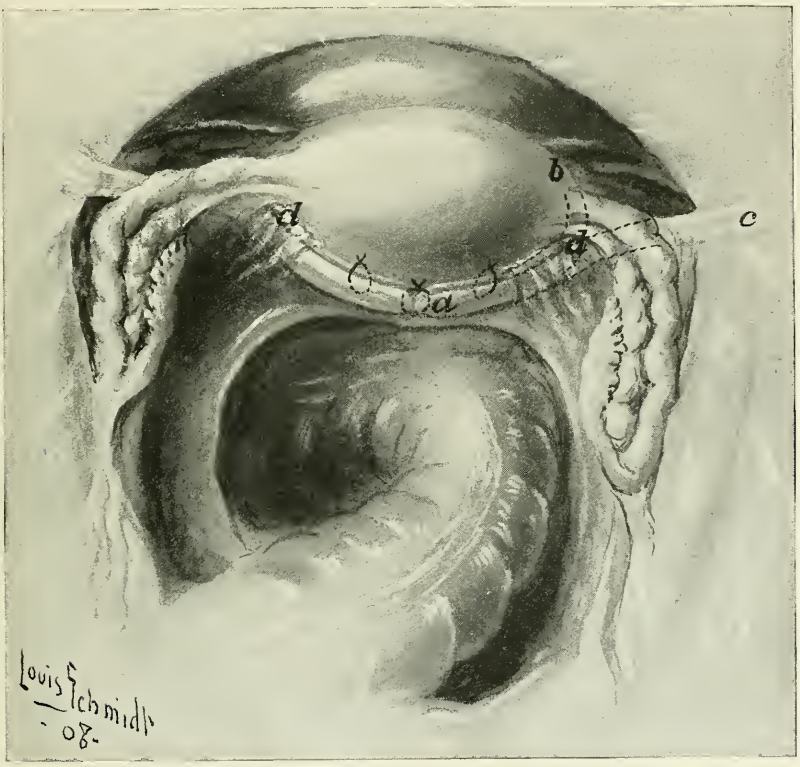


Both round ligaments drawn to the posterior portion of the broad ligament and approaching each other. (Baldy.)

through the broad ligament from behind at a point underneath the ovarian ligament and close to the side of the uterus. They emerge from the broad ligament immediately above the round ligament, and are then opened and made to grasp the round ligament about two inches from its uterine attachment. The forceps are then retracted and the loop of round ligament is brought through the broad ligament upon the posterior surface of the uterus. A similar procedure is carried out on the other side. Before stitching the loops to the uterus it is

well to scarify the surface of the uterus over which the loop is to be adjusted. The loops of round ligament are then spread out over this area and fixed to the uterus with fine linen sutures. Care should be exercised to expose the peritoneal surface of the ligaments. When the opening in the broad ligament is unduly large it is closed with one or more catgut sutures.

Fig. 258



Both round ligaments are united to each other, and at two points to the uterus itself, and the operation is completed. (Baldy.)

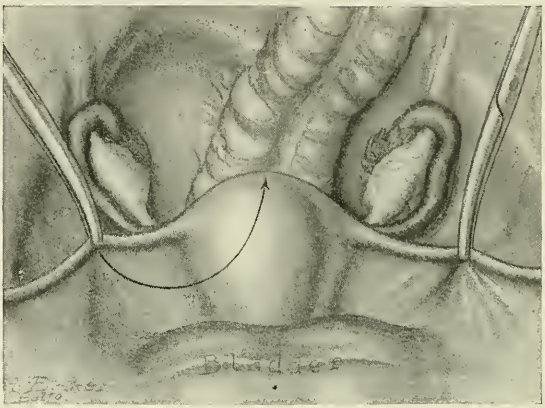
When the tubes have been removed the round ligaments are brought over the broad ligaments rather than through them.

Webster does not approve of this operation when the distal ends of the round ligaments are frail. In this event he prefers the Todd-Gilliam operation. He further advises the wearing of a Hodge or Albert-Smith pessary for several months after the operation to prevent recurrences of the displacement.

Willis' Operation.—An admirable procedure is the shortening of the round ligaments and the broad ligaments as presented by

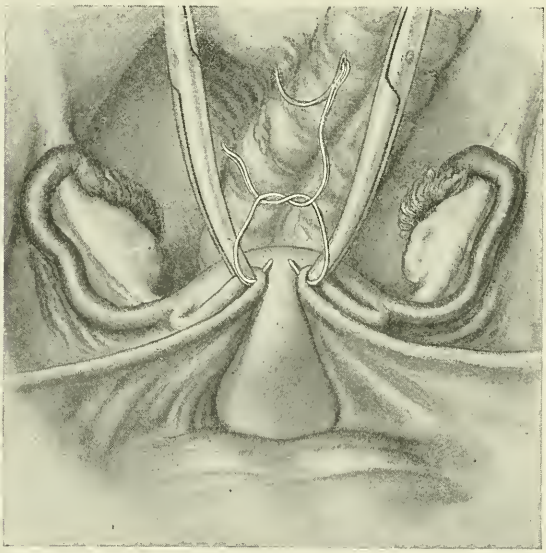
Dr. A. Murat Willis, in the *Journal of Surgery, Gynecology, and Obstetrics*, June, 1912. Following are the special features of the operation:

FIG. 259



Showing grasping of each round ligament. (Willis.)

FIG. 260



Showing passage of linen thread, on a small, round, curved needle, through half of one round ligament, then through a good bite of the uterus, then through half of the other ligament. (Willis.)

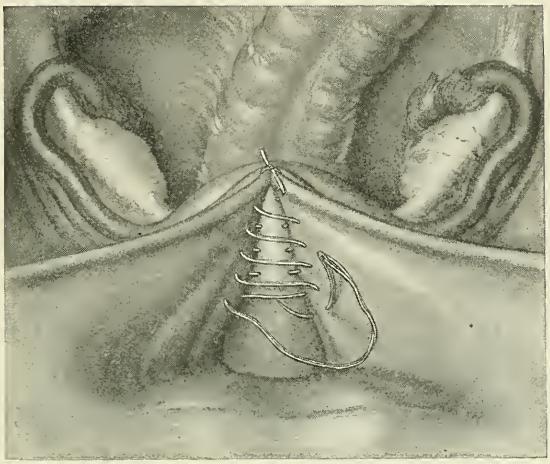
1. Maximum shortening of the broad ligaments, which have much to do in supporting the uterus.
2. Round ligaments advanced in their normal direction.

3. Line of sutures placed where intestinal adhesions are not likely to occur.

4. No additional bands created that would subject the patient to a possible intestinal obstruction.

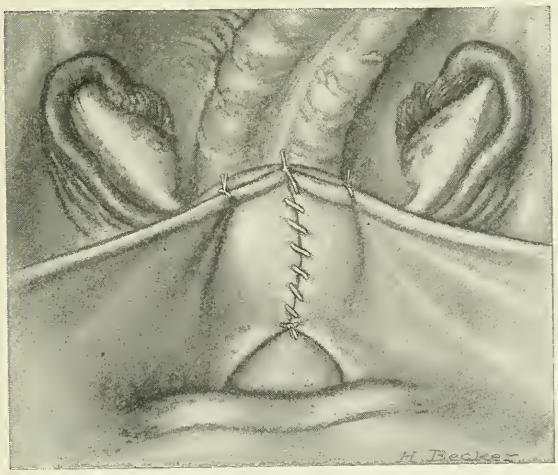
5. Simplicity of technic.

FIG. 261



Plication of the broad ligament to within one-half to three-quarters inch of the bladder. (Willis.)

FIG. 262



Showing further reinforcement by means of an interrupted suture. (Willis.)

The technic of the author is as follows:

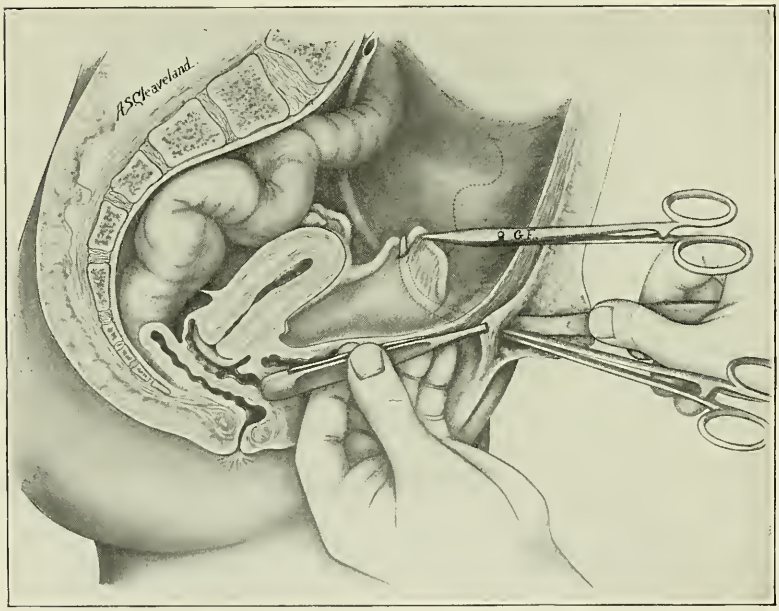
Step 1.—Each round ligament is grasped by a hemostatic forceps about two inches from its uterine end. At this point the ligament on

the one side is transfixed with a fine linen thread on a small round needle. The needle and thread are then passed through the anterior wall of the fundus and on to a corresponding point in the opposite round ligament. This suture is tied, thereby bringing the round ligaments together in the median line.

Step 2.—The same suture is brought down in the median line of the uterus and is passed in a continuous manner through the broad ligaments and uterus. In this manner the broad ligaments are materially shortened.

Step 3.—Finally an interrupted suture of linen is passed through the round ligament and fundus, midway between the natural insertion of the round ligament and the median line of the fundus.

Fig. 263

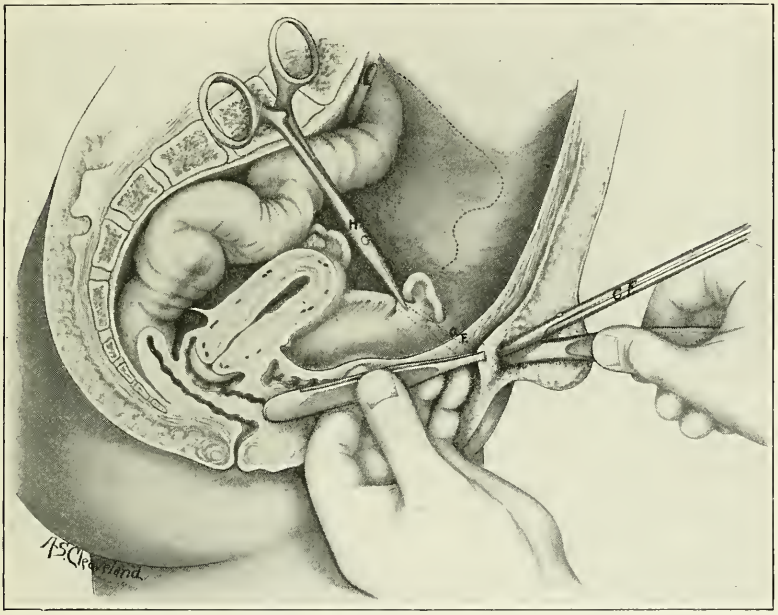


Third step: The forceps of proper curve, having passed through the fascia and obliquely through the rectus muscle, skirts beneath the parietal peritoneum to the internal abdominal ring, where it passes between the layers of the broad ligament and follows the course of the round ligament to one and one-half inches of the uterus. At that point it penetrates the peritoneum, entering the peritoneal cavity for the first time, and then grasps the round ligament proximal to the guide forceps (*G. F.*). (Simpson.)

Simpson Operation.—To overcome the objection to the various operations designed to correct retrodisplacements of the uterus, *i. e.*, strangulation of the bowel caused by the formation of bands passing through the pelvic cavity, Simpson has devised a means of drawing the round ligaments through the folds of the broad ligaments and fastening the round ligaments beneath the sheath of the rectus muscle. The steps of the operation are as follows:

1. Median abdominal incision.
2. Round ligament caught one and one-half inches from the uterus and the parietal peritoneum at the point of the internal inguinal ring.
3. Skin retracted and the fascia punctured with scalpel about one and one-half inches to the side of the lower angle of the incision.
4. Forceps of proper curve passed through the fascia and rectus muscle, and entering the broad ligament at the internal ring. The forceps passes beneath the peritoneum and by the side of the round ligament until it reaches the hemostat holding the round ligament.
5. The forceps is forced through the peritoneum and grasps the round ligament, and is drawn out through the tunnel made by the forceps.
6. The loop of round ligament is stitched to the under surface of the fascia of the rectus. This stitch fixes the loop and closes the rent in the fascia. A similar process is carried out on the other side.

Fig. 264



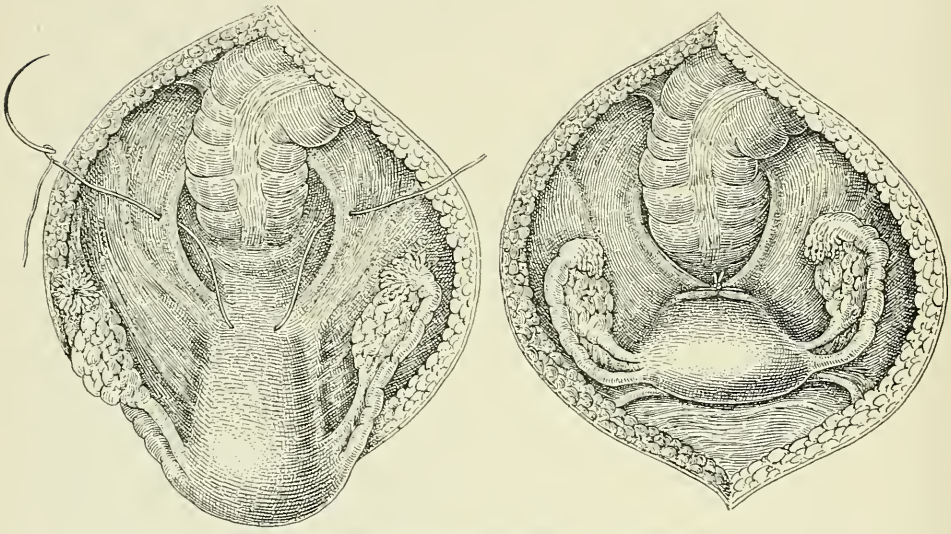
Fourth step: The margin of peritoneal wound having been caught by hemostatic forceps (*H*), the curved forceps (*C. F.*) grasps the round ligament. By withdrawal of the curved forceps the round ligament is drawn out through the canal made by the forceps. (Simpson.)

Noble Operation for Shortening the Uterosacral Ligaments.—George H. Noble has devised a simple and effective means of shortening the uterosacral ligaments. The operation consists in passing a curved needle threaded with fine linen through the uterosacral ligament at the juncture of the middle and posterior third, next passing through the posterior aspect of the supravaginal portion of the cervix, and finally through the opposite uterosacral ligament at a point corresponding to the initial point of entrance. It is desired to reproduce a retro-

uterine pouch of normal size, hence the points of transfixion of the uterosacral folds vary from a midpoint to the juncture of the middle and posterior thirds.

When the suture is tied, as in Fig. 266, there will be a single suture approximation at three points: One on the posterior surface of the cervix, and the other two on either side of Douglas' pouch. With a single suture two important things are accomplished: the cervix is retracted backward and upward, and the pouch of Douglas is reduced in size. The Noble operation is usually performed in connection with the shortening of the round ligaments.

Fig. 265 Fig. 266



Shortening of the uterosacral ligaments. Noble operation.

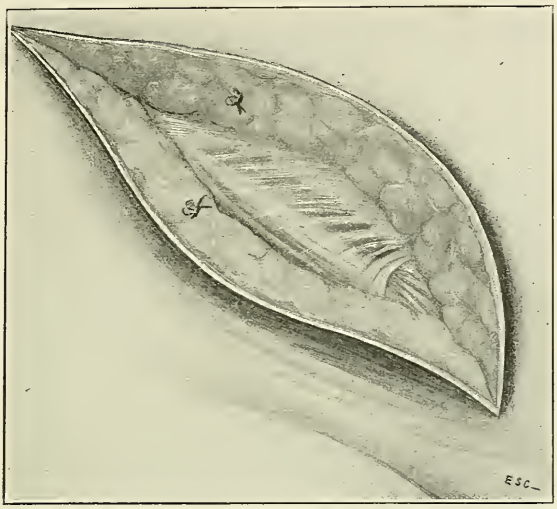
Alexander-Adams Operation.—This operation was received with great favor at a time when intra-abdominal operations were avoided for fear of infection, and when they did not appreciate, as we now do, the prevalence and influence of the various pelvic lesions which so commonly complicate retrodisplacements of the uterus.

While the extraperitoneal shortening of the round ligaments is yet to be viewed as the ideal operation in uncomplicated cases, our diagnostic ability has not attained that degree of perfection which enables us to exclude with absolute certainty such lesions as adhesions, chronic appendicitis, cystic degeneration of the ovaries, and thin-walled cystic enlargements of the tubes and ovaries. Therefore, the author concludes that the Alexander-Adams operation, while ideal in uncomplicated cases, should be discriminated against in favor of operations which necessitate the opening of the abdomen, thereby affording opportunity for the inspection of the pelvic organs.

Figs. 267, 268, 269, and 270, present the several steps of the operation.

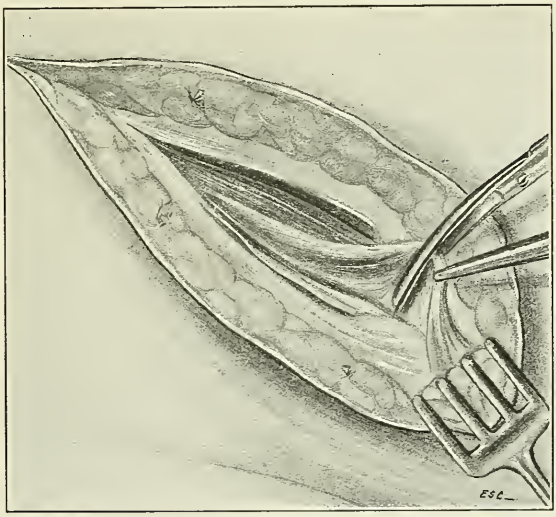
Vaginal Shortening of the Uterosacral Ligaments.—Jellette describes a new operation designed to shorten the uterosacral ligaments in

Fig. 267



Alexander-Adams operation. Step 1. Oblique incision through the skin and superficial fascia, exposing the fascia of the external oblique and the external abdominal ring.

Fig. 268

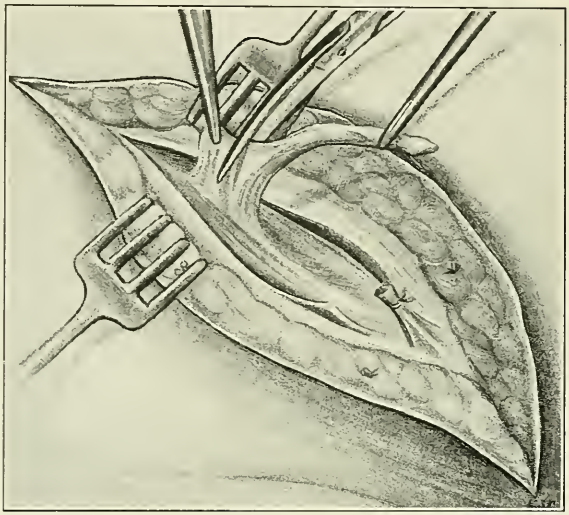


Step 2. Round ligament grasped by forceps and severed at its distal attachment.

prolapsus uteri. The operation can be combined with other procedures, such as plastic operations on the pelvic floor and the shortening of the round ligaments through an abdominal incision.

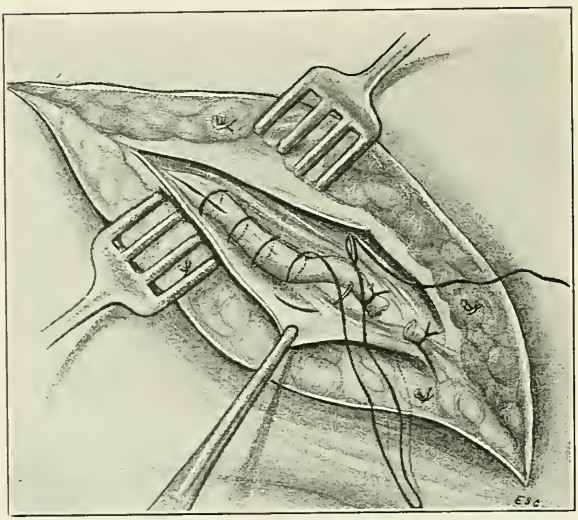
Technic of Operation.—The first step consists in dividing the vaginal mucous membrane by a circular incision as in performing a vaginal hysterectomy; next in stripping the vaginal mucosa upward

Fig. 269



Step 3. Splitting the fibers of the external oblique and exposing the round ligament in the inguinal canal.

Fig. 270

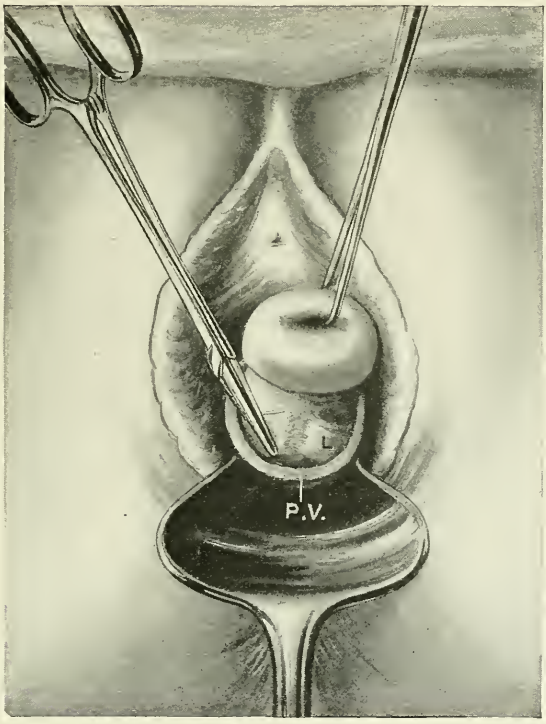


Step 4. Traction made on the round ligament. Round ligament stitched with linen to the shelving margin of Poupart's ligament.

the entire length of the cervix, thereby exposing the insertion of the uterosacral ligaments.

The second step consists in catching each ligament with forceps and severing with scissors the ligaments close to the uterus. When there is doubt as to the location of the ligaments, they can be easily identified by opening into the cul-de-sac and introducing the finger.

Fig. 271



Shortening of the uterosacral ligaments. The mucous membrane of the vagina has been divided circularly around the cervix and pushed upward so as to expose the uterine insertion of the ligaments. *L*, ligament; *PV*, cut edge of mucous membrane of posterior vaginal wall. (Jellette.)

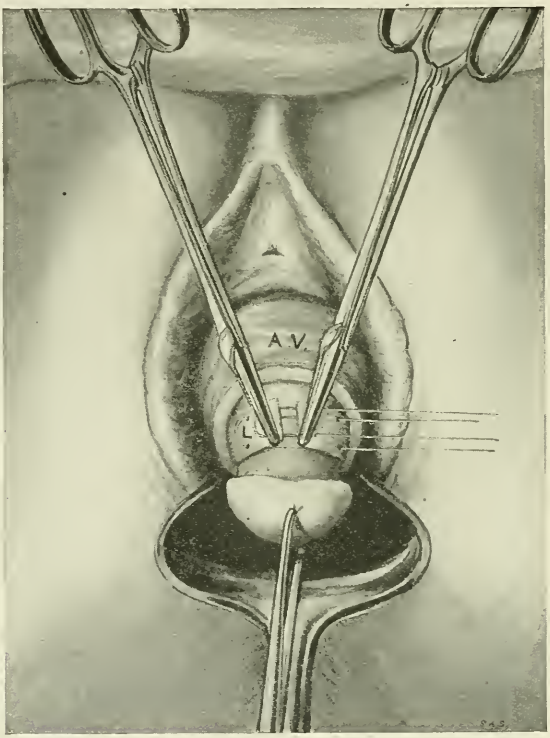
The third step consists in bringing the divided ends of the ligaments forward in front of the cervix and stretching them together and to the anterior surface of the cervix. Before passing the sutures, the cervix is pushed into its normal position so that the required amount of shortening of the ligaments may be known.

Hernia of the Uterus (**Hysterocele**).—Hernia of the uterus is of rare occurrence. The rupture usually occurs through the inguinal canal, less often through the crural ring. The only two recorded cases of crural hernia are those of Bowen and Duges. Fifteen cases of inguinal hernia of the uterus were collected by Küstner; of these, eight were

pregnant. The explanation of the development of the hernia is usually given as traction made upon the uterus by adhesions binding the hernial sac to the uterus and drawing the uterus within the sac. There is generally some associated anomaly in development.

The diagnosis is made by palpation and by an exploratory incision. Hernia of the uterus through the linea alba may follow ventrosuspension. Plate VI represents the hernia of a uterus in the fourth month of pregnancy.

FIG. 272



Shortening of the uterosacral ligaments. The ligaments have been freed from their attachment to the uterus and brought around in front of the cervix. The fixing sutures are inserted. *L*, ligament; *AV*, anterior vaginal wall. (Jellette.)

MALPOSITIONS OF THE FALLOPIAN TUBES

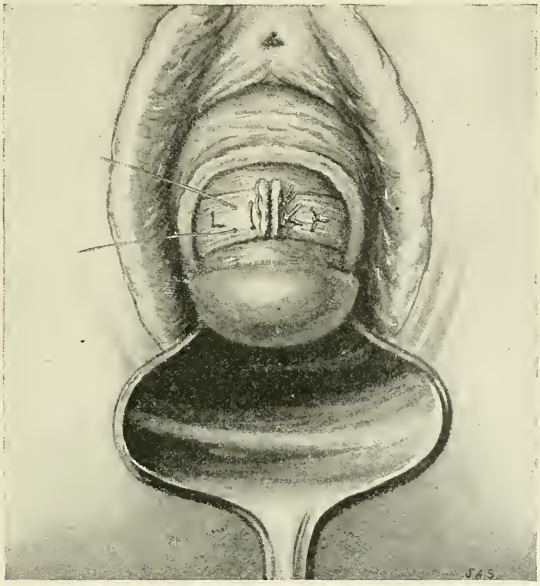
Normal Position and Anatomy.—The Fallopian tubes are two in number, one on either side of the uterus. They run sinuously from the horn of the uterus toward the side of the pelvis and lie enclosed between the two layers of the broad ligament at its upper margin. The average length of the tubes is 4 to 4.5 inches.

We speak of three segments of the tube: the isthmus, the ampulla, and the fimbriated end or pavilion.

The isthmus runs a straight course and communicates directly with the uterine cavity. Its average diameter is 2 to 3 mm. and its lumen will not more than admit a bristle.

The ampulla is the midportion of the tube; it runs in a curved direction; its wall is the thickest portion of the entire tube; the lumen will admit the passage of a uterine sound, and the entire thickness of this segment of the tube is 6 to 8 mm.

Fig. 273



Shortening of the uterosacral ligaments. The sutures which fix the ligaments in their new position are tied. *L*, ligament. The cervix is shown here at the level of the vaginal outlet for the sake of clearness. In practice it would lie high up in the vagina. The sutures which bring back the vaginal cuff into position would also be inserted at this stage, and tied posteriorly and laterally. Anteriorly they are tied as soon as the suture of the ligament is complete. (Jellette.)

The fimbriated end of the tube lies free in the pelvic cavity. It is expanded into a funnel shape (infundibulum), and around its free outer margin are primary and secondary fimbriæ, one of which runs to the ovary.

On cross-section the Fallopian tube is seen to be composed of three layers, namely, peritoneal, muscular, and mucous. Connective-tissue and elastic fibers lie between the peritoneal and muscular layers. The muscular layer consists of longitudinal and circular muscle fibers; the mucous membrane is lined with a single layer of columnar, ciliated cells. No glands are found in the mucous membrane, which is much folded in a longitudinal direction, especially in the ampulla.

The anatomical points of special clinical significance are:

1. The tube provides a direct passageway from the outer world, through the vulvar orifice, vagina, uterus, and to the peritoneal cavity.
2. The infundibular portion of the tube lies free in the pelvic peritoneal cavity.
3. The isthmus and ampulla lie between the layers of the broad ligament.

The above anatomical points will be found to be significant in relation to tubal infections and to tubal pregnancy.

Changes in the Position.—These changes may be congenital, but are more often acquired. In congenital malposition of the tubes there is usually a malposition or maldevelopment of the uterus. In a uterus bicornis the tubes lie more to the sides of the pelvis than is normal. In a rudimentary uterus the tubes lie below the normal level. Congenital hernia of one or both tubes is a rare finding.

Much more frequent are acquired displacements of the tubes. When the tube becomes enlarged and increases in weight, it tends to fall to a lower level at the side of or behind the uterus. Adhesions may pull the tube in any direction, and all swellings, whether inflammatory or newgrowths, push the tubes into malpositions. Any displacement of the uterus will almost invariably displace the tubes.

MALPOSITIONS OF THE OVARIES

Normal Position and Histology.—Anatomy.—The ovaries are two in number, lying behind the broad ligaments on a level with the brim of the pelvis, midway between the horn of the uterus and the psoas muscles. The ovary is oval in shape and about the size of an almond. The average measurements, as given by Farre, are: longitudinal diameter, one-third inch; transverse diameter, three-quarters inch; perpendicular diameter, three-eighths inch. The anterior border (hilum) is flat, and is attached to the broad ligament; the posterior border is convex and free. The ovary lies in a shallow concavity formed by the posterior layer of the broad ligament. This *fossa* of the broad ligament is a remnant of the peritoneal pouch in which the ovary of the rat and other mammalians is enclosed. Such a fossa was observed in a case operated by J. Clarence Webster.

The ligaments of the ovary are two in number—the ovarian ligament and the infundibulo-pelvic ligament. In addition to these ligaments the ovary is attached at its hilum or anterior border to the posterior layer of the broad ligament. The infundibulo-pelvic ligament connects the outer end of the Fallopian tube to the side wall of the pelvis, and may be regarded as that portion of the upper border of the broad ligament not occupied by the Fallopian tube. It is about 2 cm. in length.

The ovarian ligament extends from the horn of the uterus to the inner end of the ovary, and is about 3 cm. long.

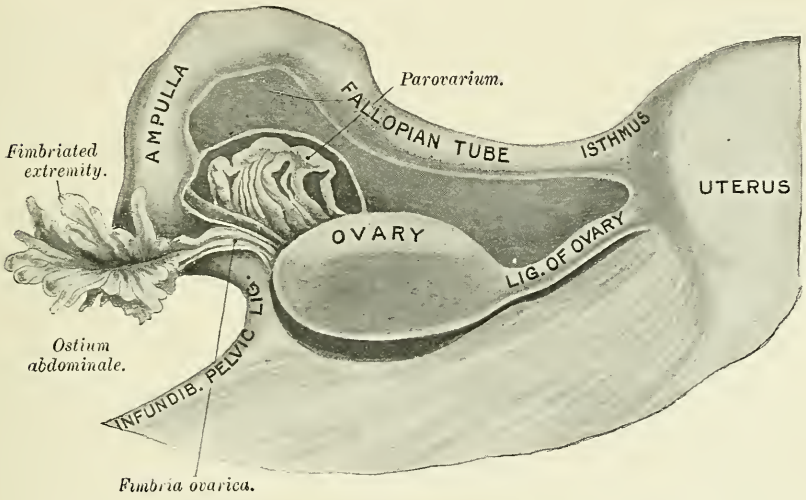
Histology.—The ovary is covered with a layer of nucleated columnar cells, continuous at the hilum with the peritoneal endothelium. At

the point of transition is a white, glistening line called the "white line of Farre." The epithelium covering the ovary is called the "germ epithelium of Waldeyer," and beneath it is a fibrous layer known as the tunica albuginea.

The framework of the ovary is of connective tissue, and is divided into cortical and medullary portions, the former lying external to the latter. The Graafian follicles are scattered throughout the ovary. Nerves, bloodvessels, lymphatics, and muscular fibers are also found in the connective tissue. The medullary portion is more vascular than the cortex.

The Graafian follicles number 40,000 to 70,000 in the infant ovary. They vary in size from $\frac{1}{100}$ to $\frac{1}{30}$ inch in diameter. The younger and smaller follicles occupy the medullary portion, and as they grow larger they are found to occupy the cortical portion. A Graafian follicle consists of:

FIG. 274



Normal anatomy of the uterine appendages.

1. The tunica fibrosa and membrana propria.
2. The membrana granulosa and discus proligerus.
3. The liquor folliculi.
4. The ovum is surrounded by the discus proligerus and composed of:
   (*a*) Zona pellucida, a homogeneous external membrane.
   (*b*) Yolk protoplasm.
   (*c*) Germinal vesicle.
   (*d*) Germinal spot.

Parovarium or Organ of Rosenmüller.—If the broad ligament be held between the light and the observer's eye, this rudimentary structure will be seen enclosed in its folds in the space between the ovary and ampulla (Fig. 274). It consists of closed tubules lined with ciliated

epithelium, which converge toward the ovary, and are united by a longitudinal one.

Changes in the Position.—The normal position of the ovary is at the level of the brim of the pelvis, midway between the horn of the uterus and the psoas muscle. There is a limited physiological range of motion influenced by changes in the position of the uterus, the filling and emptying of the bladder and rectum, the respiratory movements, and changes in the attitude of the patient. During pregnancy the ovaries are elevated into the abdominal cavity.

Pathological causes of misplaced ovaries are:

1. Displacements of the uterus and tubes.
2. Inflammatory lesions of the ovaries, increasing the weight of the ovaries and causing them to fall to a lower level, or adhesions about the ovary drawing the organ out of place.
3. Newgrowths about the ovaries, crowding them out of place.
4. Increase in size, and weight of the ovaries from abscesses, hematomata, and tumor formations, causing them to prolapse.

Descensus Ovarii.—Classification (Sänger).—*Descensus Lateralis.*—In this the ovary descends no farther than the upper border of the sacral ligament.

Descensus Posticus.—In this the ovary descends below the upper border of the uterosacral fold.

Etiology.—The causes of descensus ovarii are:

1. Increase in the weight of the ovary by:
   - (*a*) Hypertrophy and hyperplasia.
   - (*b*) Congestion.
   - (*c*) Hematoma or abscess.
   - (*d*) New-formations.
2. Relaxation of the supporting ligaments of the ovary.
3. Retropositions and prolapsus uteri.
4. Pelvic adhesions pulling upon the ovaries.
5. Pelvic and abdominal tumors pushing the ovaries downward.
6. Severe falls.

In 4000 cases Martin found the ovary descended in 564, and of this number a single ovary was prolapsed 86 times. The greatest number were found between the ages of twenty-five and thirty. They are rarely seen after fifty years of age.

A prolapsed ovary rarely remains normal. The dependent position interferes with the return circulation, and this leads to a chronic hyperplasia of the ovary (chronic ovaritis). In the 564 cases reported by Martin, chronic ovaritis was found 401 times. In 15 cases there was cystic degeneration of the ovary, and in 154 cases there was periovaritis with fixation from adhesions.

Diagnosis.—The diagnosis is based altogether upon the physical findings. The symptoms are wholly unreliable in identifying the lesion. Excessive symptoms occurred only 26 times in the 564 cases of Martin. Painful menstruation, dyspareunia, and pain in defecation are those commonly present, though they are by no means constant. How much

parametritis and other complicating lesions have to do with these symptoms cannot be determined. Sterility does not necessarily follow. It is difficult, if not impossible, to demonstrate that the reflex symptoms, such as headache and dyspepsia, are dependent upon diseases of the ovary.

The displaced ovary is recognized by its size, form, consistency, and sensitiveness to pressure. An anesthetic is always of advantage and may be indispensable. A recto-abdominal examination is often more satisfactory than a vagino-abdominal.

Not only must the position of the ovary be located, but it is necessary that the cause of the displacement be ascertained.

Treatment.—Not all prolapsed ovaries require treatment. The condition commonly exists with no discomfort, and in such cases no treatment is advised and the patient's attention should not be called to the condition. When, however, the abdomen is opened for the correction of other lesions, and one or both ovaries are found to be prolapsed, the ovary should be restored to its normal position by operative means.

Palliative Treatment.—When the ovary is congested as the result of the displacement, some relief may be afforded by the enforcement of rest, hot vaginal douches, sitz baths, glycerin and ichthyol tampons, and the careful regulation of the bowels. The application of these tentative measures is similar to that in the conservative treatment of pelvic inflammation. (See page 435.) It is useless to attempt to hold the ovary in place by pessaries or tampons, or to restore the ovary to its normal position by means other than surgical.

Radical Treatment.—When palliative measures fail to give relief, resort must be had to surgery.

When the ovaries are prolapsed, together with a backward or downward displacement of the uterus, the author favors the retro-uterine looping of the round ligaments (Webster-Baldy). In this operation the round ligaments are brought through the broad ligaments at a point below the ovarian ligament. In this manner the ovaries are elevated.

When the uterus is not displaced backward or downward, one of two procedures may be adopted: (1) The infundibulopelvic ligament may be shortened by taking a reef in it with two fine linen sutures, and, if necessary, similar sutures may be passed through the ovarian ligament. The objection to this procedure is that the ovarian veins may, in this way, be kinked and lead to passive congestion of the ovaries. The author has not observed this. (2) A button-hole may be made through the broad ligament at a point immediately below the hilum of the ovary, and the ovary brought through this opening on to the anterior surface of the broad ligament. Sutures may be passed at either extremity of this incision so as to partially close the opening, but not to constrict the blood supply to the ovary. It is said that the ovary in this position does not lessen the chances of conception. The author has done this operation in a number of instances when the ovary had been adherent and it was desired to prevent the reformation of adhesions

to the bowel—an event that would be more liable to ensue with the ovary lying posterior to the broad ligament than anterior.

Resection of the ovary should be done when a part, but not all, of the ovary is diseased. All healthy portions of the ovary should be conserved and the resected portion placed in the normal position as above suggested. Removal of the ovary is done for prolapsus only when the entire ovary is diseased; the occasion will rarely arise.

Hernia of the Tube and Ovary.—The Fallopian tube and ovary or a part or all of either organ may be herniated. These structures may lie alone in the hernial sac, or may be associated with the uterus, appendix, coil of bowel, bladder, Meckel's diverticulum, or omentum.

The lesion may be congenital or acquired, and may be unilateral or bilateral. It may develop at any period in the life of women, no age being exempt.

These hernias are classified as postoperative, inguinal, femoral, gluteal, obturative, ventral, and ischiadic, according to their point of exit. The most common variety is the inguinal.

As with other hernias we find them inflamed, strangulated, reducible, and incarcerated. Torsion of the pedicle is a possibility.

Such hernias do not of necessity prevent conception, or interfere with the development and completion of pregnancy, unless associated with anomalous developments of the genitalia. The etiology of this variety of hernia is the etiology of hernia in general, *i. e.*, increased intra-abdominal pressure and a weakening of the abdominal wall, either as an acquired or as a congenital defect. The herniated organs may be normal or may be the seat of any of the diseases otherwise found in the appendages and other structures found in the hernia sac. These pathological changes may precede or follow the development of the hernia.

Treatment.—Spontaneous cure is known, but is rare, and can only follow upon the reduction of the hernia. The rational treatment consists in a radical operation. Early operation is the most satisfactory treatment. If the tube and ovary are normal, they are to be returned to the pelvic cavity; if diseased, they are to be dealt with either by resection or removal according to the conditions found.

CHAPTER XVII

CIRCULATORY DISTURBANCES AND INFLAMMATIONS OF THE GENITAL ORGANS

Bacteriology of the Normal Genital Tract
Etiology
General causes
Local causes

The various circulatory disturbances and inflammations of the genitalia are so intimately associated from both the anatomical and clinical standpoints as to justify the grouping of the various lesions which they present. By so doing the student will better understand the intimate relation which these diseases bear to one another. They are so closely associated and so constantly complicate one another, that all the associated lesions must be considered if one is to be successful in the management of this class of cases.

An infection begins in the cervical mucosa and endometrium, but it rarely remains confined to these structures, and is conveyed downward to the vagina and vulva, and upward and outward to the myometrium, tubes, ovaries, peritoneum, and pelvic cellular tissue. A comprehensive view, therefore, must be taken of the clinical picture in its entirety.

Pelvic inflammations constitute a large proportion of the diseases peculiar to women, and are responsible, in no small degree, for invalidism and death.

Bacteriology of the Normal Genital Tract.—The bacteriology of the normal genital tract has been a subject of controversy from the beginning of bacteriological research, and is still a debatable question. Observers agree that no microörganisms are to be found under normal conditions above the external os. That they exist in large numbers and in great variety in the vagina and at the vulva is conceded by all, but to what extent these microörganisms are pathogenic is an unsettled question. The consensus of opinion among the highest authorities, such as Krönig, Menge, and Williams, is, that while pathogenic microorganisms may be found in the healthy vulva and vagina, they cannot long exist and still earlier lose their virulence. But under abnormal conditions, such as congestion and trauma and when conveyed to the upper genital organs, these same microörganisms may become virulent. The importance of these observations is obvious, for with an unobstructed passageway from the vulva to the vagina, thence to the cavity of the uterus, tubes, and free pelvic and abdominal cavity, there would be constant danger to health and life were it not for the safeguards which nature has provided.

Etiology.—Frequency.—Genital infections and circulatory disturbances in women owe their frequency to certain anatomical and physiological peculiarities. There is an unobstructed passageway leading from without to the peritoneal cavity by which infection may travel; the periodic congestion of the pelvic structures, which recurs at each monthly period during menstruation and prevails throughout pregnancy and the puerperium, renders these tissues peculiarly susceptible to infection, and the traumata incident to labor provide avenues through which infection is conveyed to the deeper structures, and to remote parts of the body. Furthermore, the mobility of the uterus and its appendages readily leads to faulty positions, with resultant circulatory disturbances. Women, through faulty dress, careless management of the diet, irregularity of the bowels and excessive exercise, are particularly prone to acquire pelvic congestion.

At no time in the history of women, from their prenatal stage to old age, is the genital tract immune to infection. The time when the genital organs are most susceptible to the invasion of microörganisms and to circulatory disturbance is the period of sexual maturity, when the tissues are at the acme of their functional activity and are most subject to injury.

Barriers to Infection.—Certain natural barriers exist in the genital tract, as safeguards against the invasion of microörganisms. In infancy the hymen presents an effective barrier to the advance of microörganisms, as do also the small cervical canal and the tortuous Fallopian tubes, with their small lumena. Finally, the underdeveloped lymph and blood channels, leading through and from the genital organs, have a limited capacity for conveying infection. At this period in life pelvic inflammations and circulatory disturbances are not common, and when they do exist are usually confined to the vulva and vagina.

In old age the atrophic changes which occur in the genital organs and lead to partial or complete obliteration of the uterine canal and Fallopian tubes, together with narrowing of the lymph and blood channels, render the upper genital tract all but immune to infection.

There is at all times, and particularly in the period of sexual maturity, a germicidal action on the part of the vaginal secretions. These secretions are acid in reaction, and none of the pathogenic germs which attack the genital tissues can thrive in an acid medium. Furthermore, the many layers of squamous epithelium which cover the surfaces of the vulva, vagina, and vaginal portion of the cervix effectively resist the direct invasion of microörganisms. In infancy this epithelial covering is delicate and in old age it is devitalized; hence it follows that vulvovaginitis is relatively frequent in the extremes of life, and is not of common occurrence as a primary lesion in middle age.

General (Constitutional) Causes.—Circulatory disturbances and inflammations of the genital organs are not infrequently influenced by conditions which lie remote from the pelvis. Failure to appreciate this fact leads to failure in the management of these cases. Following are the chief constitutional factors:

1. Gout.
2. Rheumatism.
3. Lithemia.
4. Anemia (particularly chlorosis).
5. Tuberculosis.
6. Incompetent heart.
7. Diseases of the lungs, liver, kidney and spleen, leading to pelvic congestion.
8. Acute infectious diseases.
9. General lowered resistance.

Local Causes.—1. Infections following labor and abortion.
2. Gonorrhea.
3. Instrumental and digital infections.
4. Foreign bodies (including tumors).
5. Extension from surrounding structures.
6. Mechanical disturbances.
7. Displacements of the genital organs.
8. Subinvolution of the uterus.
9. Exposure to cold.
10. Waist constriction.
11. Constipation.

1. *Infections following Labor and Abortion.*—Puerperal infection is essentially a wound infection. In every case of labor there is a necessary wound: always at the placental site, usually in the cervix, and commonly in the vagina, vulva, and perineum. Exposed to infection by pathogenic microörganisms, through the incidents of labor and the puerperium, there is a condition in puerperal sepsis which engages our serious consideration because of its frequency and its effect upon the health and life of women. While the infection usually has its inception at the placental site or in wounds located below this point, it rarely remains localized at the point of infection, but is conveyed to adjacent and remote fields. Hence it follows that pelvic inflammation of puerperal origin commonly presents a group of inflammatory lesions rather than a single isolated lesion.

2. *Gonorrhea.*—The section in Hygiene and Sanitary Science of the American Medical Association in 1901 reported that in the experience of many European and American gynecologists, 40 per cent. of women suffering from pelvic inflammation have gonorrhea. Wolbarst makes the startling statement that 70 per cent. of married women who complain of pelvic disorders have acquired gonorrhea innocently from their husbands.

The fact must not be overlooked that at least 14 per cent. of puerperal infections are due to the gonococcus. The gonococcus in these cases is either introduced during pregnancy, labor, or the puerperium, or it has lain dormant in the uterus and its appendages throughout the course of pregnancy, to be awakened to renewed activity by the congestion and trauma of pregnancy and labor. These facts emphasize

the importance of seriously considering latent gonorrheal infections, and particularly so when associated with pregnancy.

3. *Instrumental and Digital Infections.*—Failure to sterilize instruments used in examinations and operations is often responsible for infection. This is true of the examining finger as well. Gonorrheal infections may be conveyed by the speculum and the sound through failure on the part of the physician to properly cleanse his instruments. In this connection attention is directed to the pernicious habit of exploring and making topical applications to the interior of the cervix and uterus in office practice, where there is not adequate protection against infection.

4. *Foreign Bodies, Including Tumors.*—Tampons and pessaries left an undue time within the vagina will create an inflammatory reaction, leading to erosions, ulcerations, and cicatrization of the vagina and cervix. Likewise, stem pessaries create irritation of the cervix. Tumor formations, wherever located in the pelvis, are not infrequently the cause of adhesions brought about through mechanical irritation.

5. *Extension from Surrounding Structures.*—The tendency of all infections is to spread to adjacent structures. It follows that we, as a rule, have to do with a combination of inflammatory lesions in the pelvic organs.

6. *Mechanical Disturbances.*—Circulatory disturbances and inflammations are the result of such mechanical disturbances as excessive venery, running a sewing machine, and horseback-riding.

7. *Displacements of the Genital Organs.*—Displacements of a marked degree are associated with passive congestion of the displaced organ, and this congestion, in turn, predisposes to infection.

8. *Subinvolution of the Uterus.*—Subinvolution of the uterus may be the beginning of a series of organic and functional disturbances, prominent among which are the menstrual irregularities based upon a congested uterus.

9. *Exposure to Cold.*—Pelvic congestion may result from exposure at the menstrual period, and is the forerunner of menstrual disorders.

10. *Waist Constriction.*—See page 241.

11. *Constipation.*—The habit of constipation is almost universal in women, and is responsible for many of the circulatory disturbances in the pelvis.

CHAPTER XVIII

CIRCULATORY DISTURBANCES AND INFLAMMATIONS OF THE VULVA AND VAGINA

Circulatory Disturbances of the Vulva
- Varicose Veins (Angioma Vulvæ,
- Hematoma of the Vulva
- Edema of the Vulva
- Gangrene of the Vulva
- Noma Pudendi

Inflammation of the Vulva—
- Vulvitis
  - Simple Catarrhal
  - Gonorrheal
  - Erysipelatous
  - Vulvitis Furunculosis
  - Puerperal
  - Tuberculous
  - Syphilitic
  - Actinomycosis
  - Treatment
- Bartholinitis
- Pruritus Vulvæ

Inflammation of the Vagina
- Vaginitis (Colpitis)
  - Catarrhal
  - Ulcerative
  - Tuberculous
  - Emphysema Vaginæ
  - Senile
- Paravaginitis
- Vaginismus

CIRCULATORY DISTURBANCES IN THE VULVA

Varicose Veins (Angioma Vulvæ).—In varicose veins of the vulva the veins are tortuous, knotty, and irregularly dilated. This condition may involve one or both labia majora.

Etiology.—The most prominent etiological factor is pregnancy.

1. *Pregnancy.*—Pregnancy is always associated with venous congestion in the pelvis. If, as a result of incarceration of the pregnant uterus or complicating tumors, the return circulation is retarded, the veins of the vulva, as well as those of the pelvis, become overdistended.

2. *Miscellaneous Causes.*—Miscellaneous causes, such as heavy lifting, long-standing pelvic tumors, uterine displacements, and pelvic exudates operate in producing varicosities of the vulva.

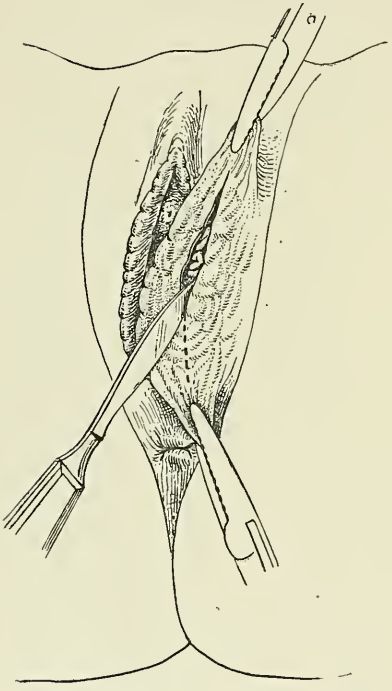
Symptoms.—A moderate distention of the veins may give rise to no inconvenience, but prominent veins which enlarge the vulva cause a feeling of heaviness, irritation, and itching. Locomotion and intercourse may be embarrassed.

Diagnosis.—On inspection an irregular, elongated, knotty mass is seen to occupy one or both labia majora, more rarely other vulvar structures and the vaginal walls are affected. The color is a deep blue. On palpation the prominent veins are made to disappear unless excessively enlarged. While rarely attaining a size greater than a hen's egg, they have reached the size of a child's head.

Prognosis.—When occurring for the first time in pregnancy the swelling is greatly reduced in size shortly after childbirth and may wholly disappear, but with each succeeding pregnancy the condition becomes permanent and larger. The veins may rupture and give rise to a hematoma or to external hemorrhage of alarming proportions. Again, thrombosis of the veins may lead to embolism that may prove fatal.

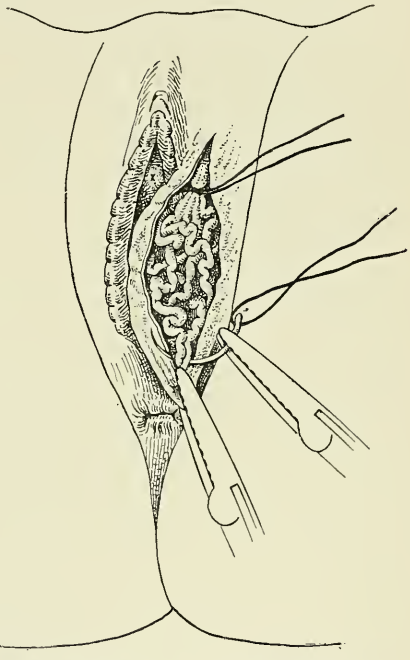
Treatment.—Unless the mass gives rise to serious disturbances or is very large, palliative measures will suffice.

Fig. 275



Varicocele of the vulva. A median incision in the labium exposes the dilated veins.

Fig. 276



The veins are ligated with catgut at either extremity and the overlying incision in the skin is closed with a running horse-hair suture.

Palliative Treatment.—When arising in the course of pregnancy an abdominal binder should be worn, together with a gauze vulvar pad, supported by a T-binder. This combination gives support to the uterus and distended veins. All waist constriction must be removed and straining and heavy exertion of all kinds avoided. When the condition causes much distress the patient should be enjoined to rest in the recumbent position more or less of the time. To relieve the sensation of itching and burning, a compress of cold water or of lead water and laudanum should be applied to the vulva. The patient

should be instructed in event of hemorrhage to tightly compress the bleeding veins until surgical aid is secured.

Operative Treatment.—When the symptoms cannot be relieved by conservative measures it becomes imperative to ligate and remove the veins. The accompanying diagrams (Figs. 275 and 276) illustrate the method of procedure.

FIG. 277

Rodent ulcer of the vulva. (Hertzler.)

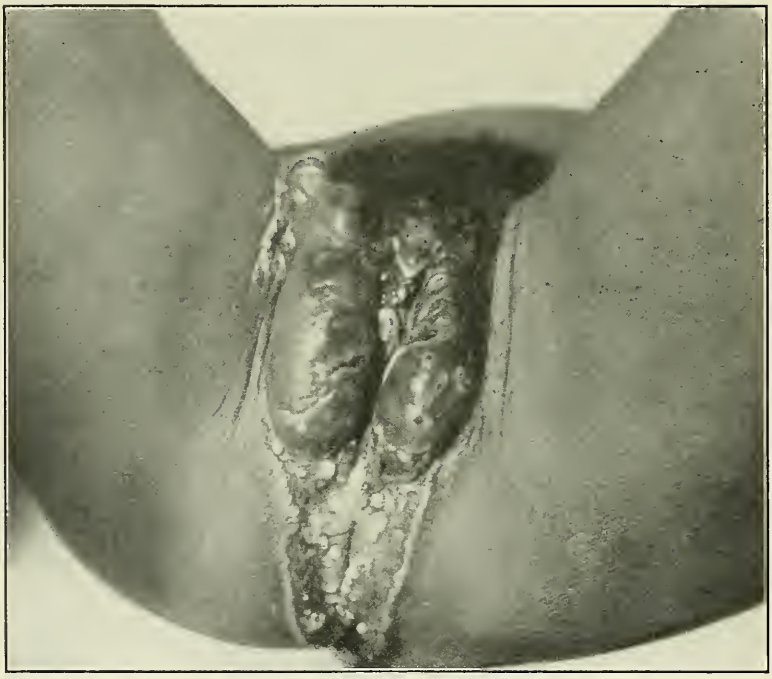
Hematoma of the Vulva.—Hematoma of the vulva may arise from rupture of the veins during labor or from direct injury. Such accumulations of blood may attain the size of a man's head. While suppuration of the blood-clot may occur, gradual absorption is the rule.

Treatment.—Failure of the blood-mass to absorb, or in event of suppuration of the blood, an incision is made for the purpose of establishing drainage. Every effort should be made to favor absorption. Rest should be enjoined, and a soft, firm compress held in place by a T-bandage will usually hasten absorption.

Edema of the Vulva.—Edema of the vulva may arise from an obstruction to the general circulation in diseases of the heart, kidney, liver, etc., but it is more often the result of local interference with the circulation from pressure of the pregnant uterus, pelvic tumors, and exudates. The swelling may be bilateral or confined to one side, and may be as large as a child's head.

Symptoms.—Moderate edema gives rise to no symptoms, but the swelling may be so large as to interfere with walking, sexual intercourse, and even with urinating. This exaggerated form is usually associated with general anasarca.

Fig. 278



Rodent ulcer of the vulva. (Hertzler.)

Prognosis.—The prognosis is dependent upon the underlying cause. When associated with general anasarca the outlook is grave. And when it is a phase of angioneurotic edema the prospect of cure is not encouraging.

Treatment.—The essential element in treatment is to remove, if possible, the cause. The condition may be palliated by a compress of lead water and laudanum. Scarification of the swollen vulva is indicated when there is great tension.

Gangrene of the Vulva.—Gangrene of the vulva is a rare but grave condition.

Etiology.—*Trauma.*—A direct blow or the falling astride of an object may result in death of the bulbar tissue. More often the trauma is received in pregnancy and in labor, and is usually preceded by a hematoma or edema of the vulva.

Infectious Diseases.—Infectious diseases, such as puerperal sepsis, erysipelas, typhoid fever, diphtheria, measles, scarlet fever, and smallpox, are occasional causes.

Noma Pudendi.—Noma pudendi is a peculiar local infection resulting in death of the tissues. The disease is commonly known as rodent ulcer.

Symptoms.—The labium majus of one side is the site of predilection. In the beginning, there is a tender, reddened zone which deepens in color and finally becomes black, with a red zone surrounding the gangrenous area. Vesicles and bullæ appear, and later the tissue sloughs away, exposing a weeping surface.

Prognosis.—The prognosis is grave in this condition; septicemia, embolism, and exhaustion are the causes of death. When there is septic absorption, alcoholic stimulants and a nutritious liquid diet should be given freely.

Treatment.—In gangrene of the vulva, including noma pudendi, all dead tissue should be excised and the wound frequently irrigated. Warm antiseptic fomentations should be applied and renewed at short intervals. For this purpose a sterile gauze pad, saturated with a solution of formalin 1 part, glycerin 400 parts, and sterile water 2000 parts, should be used. Over this a covering of rubber protective should be placed, and held by a T-bandage.

The thermocautery may be effectively used from time to time, and is especially serviceable when the gangrenous area is large.

INFLAMMATIONS OF THE VULVA

Vulvitis.—Simple Catarrhal Vulvitis.—Simple catarrhal vulvitis is commonly found in the acute stage, rarely in the chronic stage.

1. *Acute Catarrhal Vulvitis.*—Acute catarrhal vulvitis presents a surface that is swollen, red, and glistening. Later there is a mucopurulent secretion on the vulvar surface. Part or all of the vulvar structures may be enlarged, but it is unusual for the disease to extend into the upper genital tract, as is the case with gonorrheal vulvitis.

2. *Chronic Catarrhal Vulvitis.*—In the chronic stage the swelling subsides and the redness largely disappears. The secretion is less abundant, but remains of a mucopurulent character. Abrasions and ulcerations are seen on the vulvar surface, and the inguinal glands may enlarge.

Symptoms.—In the acute stage the patient complains of pain and tenderness in the affected area; the urine coming in contact with the inflamed vulva causes smarting and burning; walking is uncomfortable, and the skin surface on the inner aspect of the thigh and anal region becomes irritated from the secretions. In the chronic stage, itching

and burning are complained of. The discomfort may be so great that the patient finds life intolerable.

Diagnosis.—It is essential to recognize this form of vulvitis from the gonorrheal form. An innocent individual may acquire a gonorrheal infection, hence the unreliability of the history in many cases. The infallible test is found in the microscopic examination of the secretions. The presence of pus in the urethra, of an involvement of the glands of Bartholin, and of the inguinal glands are presumptive but not conclusive evidences of the gonorrheal nature of the infection.

Gonorrheal Vulvitis.—This subject is presented in Chapter XXIII.

Erysipelatous Vulvitis.—Erysipelas of the vulva is occasionally observed in the puerperium and in the newborn. Recurrent attacks have been experienced. The infection is liable to become active at the menstrual period. The essential cause is the streptococcus of erysipelas. Predisposing factors are puerperal wounds, erosions, ulcers, abrasions of the vulva, unsanitary surroundings, and lowered general vitality.

Symptoms.—The disease is usually ushered in by a chill, elevation of temperature, and vomiting. The temperature ranges from 100° to 105.5°, and will usually persist throughout the course of the disease. In severe cases general toxic symptoms are present. The pulse is quickened, and there is headache, drowsiness, and possibly delirium.

The eruption usually begins as a single patch upon the vulvar surface, which spreads with more or less rapidity over the surface, and presents a sharp, often indented border that is raised above the healthy skin. The color deepens to a dark hue, and vesicles and blebs may form. These may suppurate and leak, leaving a dry crust. As the lesion extends, the central area becomes flattened and pale. Isolated patches may appear in the neighborhood of the original lesion. The author has seen erysipelas of the vulva in an infant extend upward through the vagina and uterus to the peritoneum. The lymphatics and lymph glands of the groin are involved. The lymphatics appear as red streaks and the glands may suppurate.

The subjective symptoms are itching, burning, tingling, and a feeling of tension.

Diagnosis.—The diagnosis should be made with little difficulty. Following a chill and accompanied by constitutional disturbances, the lesion is found upon the vulva as a sharply circumscribed, swollen red patch which advances steadily to the surrounding structures.

Erysipelas is to be distinguished from eczema, erythema, and urticaria.

In eczema the constitutional disturbances are not marked, there is no swelling of the tissues, the margins of the lesion fade into the surrounding parts, the color is not so brilliant, and the surface is rougher and more scaly. Itching is more intense.

In erythema there are no constitutional symptoms, the color disappears on pressure, and springs back promptly when the pressure is removed. The lesion does not creep over surrounding structures, and the duration of the lesion is short.

In urticaria there are no constitutional symptoms and no tenderness, but there is great itching, a short course, and the presence of wheals or a history of them.

Treatment.—There is no specific treatment for erysipelas. The tincture of chloride of iron in 20 to 60 minim doses should be given every two to four hours. The local treatment is of great importance. The lead and opium wash has long been used, and is prescribed as follows:

℞—Liq. plumbi subacetat. dil. . . . . ʒj–iij
Tinct. opii . . . . . ʒij–iv
Aquæ . . . . . q. s. ad Oj
Sig.—Apply locally.

Ichthyol in a 25 to 50 per cent. solution is a splendid application. Painting the surface with tincture of iodine, diluted with equal parts of alcohol, is recommended.

Puerperal Vulvitis.—Puerperal vulvitis occurs as the result of an irritating lochial discharge. A diffuse erythema and ulceration may arise. The ulcers are usually superficial, with a gray or brownish colored base and an infiltrated margin. A false membrane may cover the ulcerated surface, suggesting in appearance a diphtheritic ulcer. The organism commonly found in these ulcers is the streptococcus. Very rarely the Klebs-Loeffler bacillus is obtained.

Tuberculous Vulvitis.—Tuberculous vulvitis is a rare lesion. Irregular ulcerations are found at any point in the external genitals. These ulcers have a ragged, undermined margin, with an irregular base covered with pus and studded with grayish tubercle. Fistulas may lead to the bowel. Extensive cicatrization, causing deformity of the vulva, may follow the ulceration. The tubercle bacillus is difficult of demonstration in the secretion. A section taken from the involved structures may show giant cells and tubercles, more rarely the tubercle bacillus.

Syphilitic Vulvitis.—Syphilitic vulvitis occurs in the primary, secondary, and tertiary stages. In the primary stage the chancre may be found at any point on the vulva. The extent of the lesion varies in proportion to the associated edema and cellular infiltration, the greatest swelling occurring in the labia majora, where the cellular tissue is loosest and most abundant. In the secondary stage the vulva is often covered with condylomata, which early ulcerate and are covered with a slimy secretion of a highly infectious nature. In the tertiary stage gummata are rarely found.

The so-called soft chancre (ulcus molle) has its favorite seat in the frenulum and labia minora. The ulcer formed from the soft chancre is round, with a sharp border and a smooth base covered with pus. In the neighborhood of the ulcer the vessels are markedly dilated.

Diphtheritic Vulvitis.—True diphtheria may attack the vulvar surface. The author has seen but one such case. The nurse in attendance had a diphtheritic infection in the throat and the patient was in the early puerperium. The patient responded to antitoxin.

Actinomycosis of the Labia Majora.—Actinomycosis of the labia majora has been observed once by Lieblenis and again by Bongartz.

Treatment of Vulvitis.—Whatever the cause of the inflammation the treatment must be based upon two essential principles: the removal of the cause and the maintenance of rest and cleanliness. Failing in these essential principles, recovery will be slow and uncertain.

Acute Stage—Throughout the acute stage of vulvitis rest in bed is imperative. Antiseptic vaginal douches should be given every four to six hours, and these should be ten minutes in duration and at a temperature of 110° F. The author's preference is for formalin douches, 1 to 2000. When due to gonorrheal infection, the infected surface should be subjected to an application of 25 per cent. aqueous solution of argyrol. This is best done by loosely packing the vulvar orifice, and if possible, the vagina, with sterile gauze or absorbent cotton, saturated with this solution. These tampons are to be removed in four to six hours. When the acute stage subsides, a 4 per cent. solution of silver nitrate is applied twice weekly to the infected surface, and formalin douches are continued morning and evening. To allay irritation of the surrounding surfaces, the douches should be followed by the application of oxide of zinc ointment, bismuth, calomel, talcum, or lycopodium, after which a sterile vulvar pad is applied and held in place by a T-binder. If the urine is acid and irritating, large quantities of water should be drunk and liquor potassæ given; if alkaline, the benzoate of sodium may be given. Laxatives may be required and the diet should be light and nutritious. The crude pyroligneous acid is applied to the vulva and vagina in the acute stage of vulvovaginitis. This may be done by means of a swab or by injecting through a syringe.

In *vulvitis furunculosis* the pustules should be opened with a knife, the surface cleansed with an antiseptic, and an antiseptic dressing applied. For this purpose the author uses a pad of sterile gauze moistened with the following solution: formalin, 1 part; glycerin, 400 parts; water, 2000 parts. When the inflammatory reaction is great, the surface may be bathed with lead water and laudanum. The mixed vaccines (staphylococcic) are worthy of a trial in these cases.

Tuberculous vulvitis demands excision of the involved tissues and, when possible, suturing of the wound.

Syphilitic vulvitis demands specific treatment, both general and local.

Diphtheritic vulvitis will respond to the antitoxin.

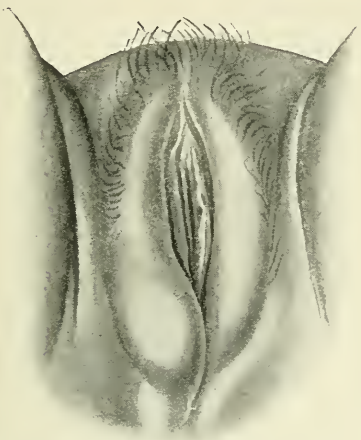
Chronic Stage.—In chronic vulvitis the underlying cause in the majority of cases is gonorrhea, the treatment of which does not differ essentially from that of the acute stage. It is not necessary to confine the patient to bed, though only moderate exercise is permitted. Cleanliness must be maintained by douches of bichloride of mercury, 1 to 4000, or formalin, 1 to 4000; the irritated surface is to be kept dry and the irritation relieved by dusting powders. On alternate days the surface is painted with nitrate of silver, grains 10 to fluidounce 1. To excoriated surfaces more concentrated solution of silver nitrate may be applied. In stubborn cases the vulva and vagina may be packed with

sterile gauze saturated with a 25 per cent. solution of argyrol. Care should be given the bowels and urine, as suggested above.

Bartholinitis.—Bartholinitis is a frequent accompaniment of a gonorrheal infection. In the majority of cases only the mouth of the gland is infected. It not infrequently happens that there is an occlusion of the outlet of the gland, leading to a distention of the gland into a cyst containing a clear sterile fluid. As a result of secondary infection with pyogenic microörganisms an abscess may develop within the gland.

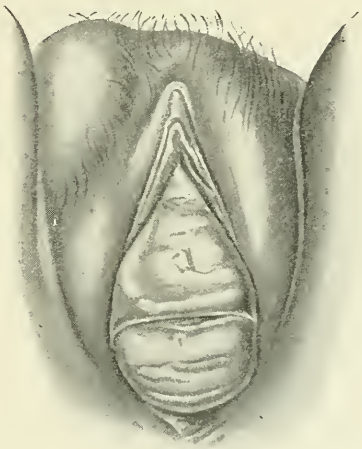
Vulvitis Furunculosa.—Multiple small abscesses are found upon the labia majora, less frequently upon other portions of the vulva. These abscesses are usually found in the sebaceous and sweat glands. Of all the glands of the vulva, the Bartholinean glands are most

FIG. 279



Enlargement of the vulvovaginal gland by cyst or abscess. (Schaffer.)

FIG. 280



Right inguinal hernia simulating vulvovaginal cyst or abscess. Eversion of anterior and posterior vaginal walls. (Schaffer.)

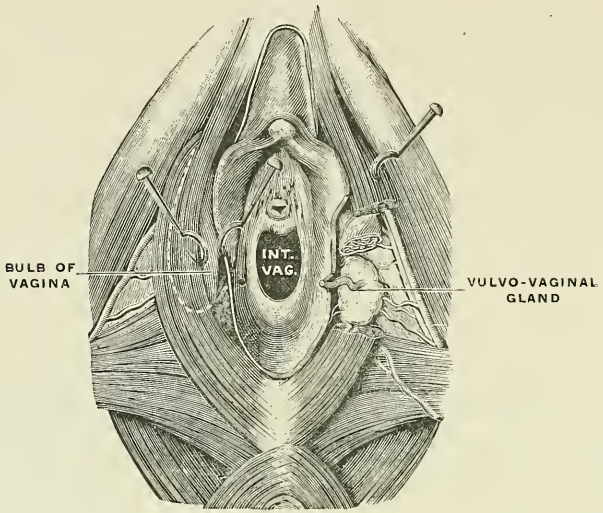
commonly infected, and gonorrhea is the cause in a great majority of the cases. As a rule the glands are not extensively involved. The mouths alone of the glands may be involved, giving rise to the so-called maculæ gonorrheica of Sänger. Gebhard states that when suppuration occurs in the gland there is always a mixed infection of the gonococcus and staphylococcus. It is unusual to observe Bartholinitis in infants. The size which these infected glands may attain is from that of a split pea to a man's fist.

The infected Bartholinean gland is located in the labia majora; is round or oval, firm or fluctuating, and may or may not be tender.

It is to be differentiated from hernia into the labium (Figs. 279 and 280). The latter is not tender, is elongated, tympanitic on percussion,

and may be made to disappear by taxis. When reduction of the hernia is impossible, and when strangulation and gangrene of the gut have

Fig. 281

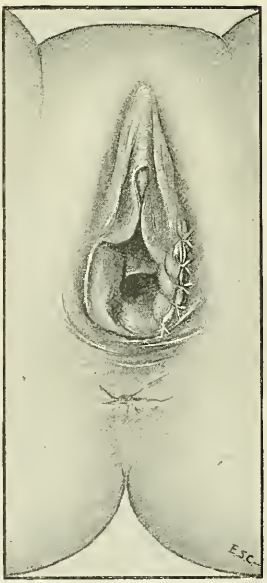


The vulvovaginal gland or gland of Bartholin. (The dotted line indicates the limits of the bulb of the vagina. (Testut.)

Fig. 282

Cyst of the gland of Bartholin.

Fig. 283



Line of suture after removal of the cyst of the gland of Bartholin.

occurred, the usual symptoms of intestinal obstruction will suggest the probable nature of the swelling. Evidence of gonorrheal infection elsewhere in the genito-urinary tract will be suggestive.

Treatment.—In the absence of the development of a cyst or abscess, the treatment does not differ from that recorded above in the discussion of vulvitis. When a cyst or abscess has formed, excision is the only treatment to be considered. This can be done, as a rule, under local anesthesia by the hypodermic injection of Schleich's solution, made as follows: morphine sulphate, gr. $\frac{1}{10}$; cocaine hydrochlorate, gr. $\frac{1}{2}$; aqua pura, oz. 1.

When no pus is present the wound is closed with sutures of plain catgut, and when pus is present the cavity is packed with strips of iodoform gauze and allowed to heal by granulation. In making the incision the skin surface should be chosen unless an abscess is pointing on the mucous surface; this obviates the presence of a tender cicatrix.

Pruritus Vulvæ.—Pruritus vulvæ is a term applied to an itching of the vulva, accompanied by swelling of the parts and nervous irritability. The most frequent area involved is the clitoris; next in order of frequency are the labia, vestibule, mons veneris, perineum, and anus.

Symptoms.—The lesion is usually symptomatic, but there is a small proportion of cases in which it appears to be idiopathic. As a symptomatic lesion the underlying causes are largely attributable to mechanical and infectious irritations of the vulva. As mechanical irritations, masturbation and excessive sexual intercourse are excitants, which may be the result as well as the cause of pruritus; also, the wearing of filthy pessaries, uncleanliness of the vulva, irritating urine in vesico-vaginal fistulæ and diabetes, and the irritating discharge from malignant growths. Of the infectious agencies may be mentioned parasites, including the oidium albicans, pediculi, and intestinal worms. Any condition bringing about passive congestion of the pelvis may cause pruritus vulvæ in the same manner as hemorrhoids cause pruritus ani.

Many of the pelvic lesions may reflexly cause itching of the vulva. Pruritus vulvæ, associated with dryness and sensitiveness of the skin, suggests the presence of kraurosis of the vulva. Disorders of the blood may account for some cases. Finally, a small number are to be attributed to neuroses, though a mechanical cause is always to be sought. The condition is frequently associated with pregnancy and without assignable cause.

Diagnosis.—The diagnosis of pruritus vulvæ may be made from the patient's complaint of itching, but it is most essential that the cause of the pruritus be determined by a general as well as local physical examination.

Pruritus vulvæ may generally be considered as a symptom of some general or local lesion. Every case of pruritus should suggest the possibility of diabetes, and should call for a urinalysis. The presence

of irritating vaginal discharges, of worms, and of parasites are to be sought. The sexual habit of the patient should be a subject of inquiry.

The one dominating symptom is itching over part or all of the vulva. So distressing is this itching that the patient becomes irritable and nervous; she shuns society, and may even develop into a maniac or suicide. The itching is always worse at the menstrual period, during sexual intercourse, in warm weather, and after physical exertion.

Local changes in the skin surface of the vulva are commonly present and are largely due to scratching.

Webster and Sänger studied independently the histological changes of the skin removed from the affected area. Webster found the genital corpuscles of Krause in the clitoris, and called them tactile corpuscles. Nerve endings in the form of end-bulbs were found in large numbers A fibrosis of the corpuscles of Krause and of the end-bulbs and nerves were found by Webster and confirmed by Sänger. There was a marked small round-cell infiltration in the subepithelial tissues, and the superficial epithelium was largely removed.

Treatment.—The treatment is general and local.

General Treatment.—The urine is rendered bland and non-irritating by drinking freely of milk and water. Diuretics are given to control an overacidity or alkalinity of the urine. All alcoholic drinks are forbidden. The bowels are carefully regulated by laxatives. Exercise is to be taken with caution, inasmuch as too much walking excites the itching. When the patient is neurotic the rest cure may prove of great benefit. Change of environment is frequently beneficial. Sleep is often disturbed, demanding hypnotics. For this purpose the opiates are to be avoided, and in their stead bromides, sulphonal, trional, and veronal, in large doses, are given at bedtime.

Local Treatment.—Vaginal douches are essential to the keeping of the vulvar surface free from the vaginal discharges. For this purpose creolin (1 to 200), lysol (1 to 200), boric acid in a saturated solution, and carbolic acid (1 to 1000) are used. When the douches do not prevent the leucorrheal discharges from soiling the vulva, a sterile lambs' wool tampon should be placed in the vagina. These tampons should be saturated with 1 part of boroglycerin and 3 parts of glycerin, or may be dusted with boric acid powder or equal parts of boric acid and bismuth.

To relieve the itching, countless remedies have been applied to the affected surface. The following are some of the most reliable remedies:

1. Ten per cent. cocaine.
2. Five per cent. carbolic acid.
3. Carbolo-salve, 5 per cent.
4. Pure ichthyol, applied once or twice daily.
5. Lead water and laudanum.
6. Corrosive sublimate, 1 grain to the ounce of the emulsion of almonds.
7. Menthol applied by a pencil.
8. Oxide of zinc ointment.

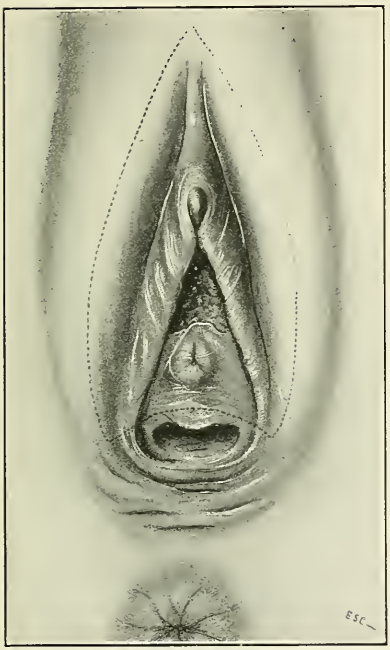
9.

℞—Acidi carbolici . . . . . ʒij
Mentholi . . . . . gr. v
Unguenti petrolati . . . . . ℥ij
Unguenti creosoti . . . . . ʒj

10.

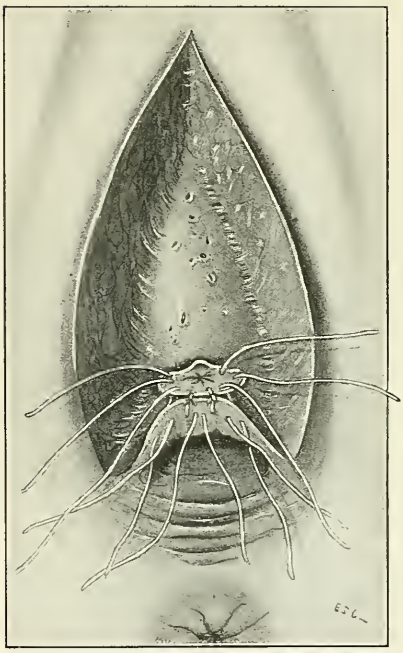
℞—Mentholi . . . . . gr. viij
Acidi carbolici . . . . . ʒj
Ung. camphoræ,
Ung. petrolati . . . . . āā ʒiij

Fig. 284



Excision of the vulva for tuberculosis of the vestibule. Step 1. Outlines present area of denudation. (After Kelly.)

Fig. 285



Excision of the vulva. Step 2.

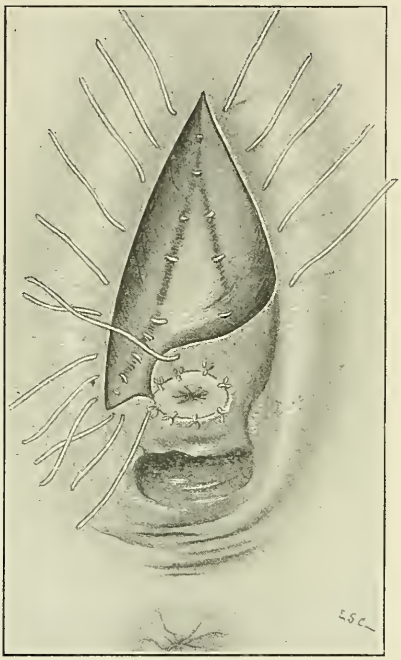
The *x*-rays are worthy of trial in obstinate cases of pruritus which have not yielded to the application of local remedies and before resorting to surgical measures.

An analysis of the urine should never be neglected, and if nephritis or diabetes be discovered, the proper line of treatment will be suggested. Pediculi may be found in the pudendal hair. They are quickly disposed of by shaving the parts, washing with green soap, and applying carbolo-salve (10 per cent.). Ascarides may be detected by watching the stools.

Irritating vaginal discharges are to be removed by treatment directed to their underlying cause and by frequent vaginal douches.

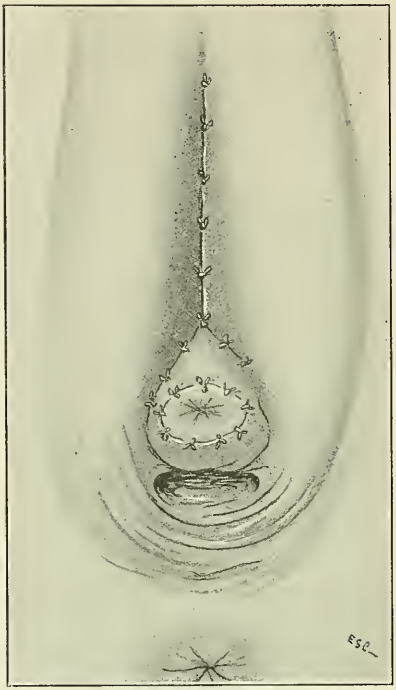
Surgical Treatment.—When all else has failed, excision of the affected parts must be resorted to. This may involve the sacrifice of part or all of the vulva. (See Figs. 284, 285, 286, and 287.)

Fig. 286



Excision of the vulva. Step 3.

Fig. 287



Excision of the vulva. Step 4.

INFLAMMATIONS OF THE VAGINA

Vaginitis (Colpitis).—Vaginitis rarely exists alone. As a rule, it is associated with vulvitis and endometritis, and not infrequently with a similar involvement of the entire genital tract.

Etiology.—With few exceptions vaginitis is due to bacterial invasion. Mechanical and thermic irritants are accountable for a small number of cases.

Of the microörganisms causing vaginitis, the gonococcus is by far the most frequent. A purulent discharge from the cervix containing the gonococcus may fail to infect the vagina because of the protecting epithelium, which, when intact, resists all bacterial invasion.

If, however, the epithelium of the vagina is lost or its vitality is lowered infection will follow. We, therefore, find primary gonorrheal vaginitis less frequently in the young than in those of advanced years, where the epithelium has lost its full power of resistance and is more

or less desquamated. Repeated attacks of vaginitis may result from contamination by the secretions of the uterus, tubes, and urethra. Some assert that chronic gonorrheal vaginitis does not exist.

Injudicious exercise and sexual excesses may be the explanation of exacerbations.

Puerperal vaginitis is nearly always caused by the staphylococcus or streptococcus. The Klebs-Loeffler bacillus is rarely the cause of vaginitis. The streptococcus of erysipelas is occasionally found, particularly in infants. The presence of the oidium albicans and leptothrix has been demonstrated. Entozoa can invade the vagina from the rectum. Ascarides and similar parasites of the intestines may invade the vagina and set up a vaginitis.

Infections from the bowel, as from dysentery and typhoid fever, may invade the vagina. Infection may also travel from the bladder to the bowel. An irritating and infectious discharge from the uterus or from a pelvic abscess opening into the vagina may infect the vagina. It is probable that maceration of the epithelium by fluids used in douching, favors infection from such discharges.

The secretions from malignant growths of the uterus are particularly irritating to the vaginal mucosa.

Trauma from ill-fitting and foul pessaries, from tampons saturated with irritating secretions, and from masturbation predisposes to infection. Schultze claims that decomposition of stagnated menstrual blood behind the hymen in chlorotic girls is not infrequently a cause of vaginitis.

Tumors lying within the vagina may act as mechanical irritants to the vaginal mucosa.

Anatomical Diagnosis.—The following morphological forms are recognized:

1. Catarrhal Vaginitis.—Catarrhal vaginitis is recognized by a reddening, swelling, and increased secretion of the vaginal mucous membrane. These changes are proportionate to the degree of acuteness and intensity of the infection. The surface is rarely uniformly red, but rather mottled red and gray. In the chronic stage slight reddish elevations stud the surface. These elevations are particularly prominent in old age when contrasted with the smooth, pale gray background.

The microscope shows a diffuse round-cell infiltration and capillary congestion of the subepithelial connective tissue. There may be more or less desquamation of the surface epithelium. The deep layers of connective tissue are rarely involved. In the senile variety, punctate hemorrhages are particularly liable to occur in the connective tissue. Gebhard speaks of a variety called croupous vaginitis, in which there is formed on the surface a false membrane composed of fibrin and leucocytes, together with desquamated and degenerated epithelium. He observes that a similar lesion is often found in the bowel, and reasons that there is a specific cause underlying both conditions.

2. Ulcerative Vaginitis.—It is possible for ulcers to develop in the advanced stage of catarrhal vaginitis; this, however, is exceptional.

The loss of epithelium is usually superficial, and in healing does not lead to cicatrization.

(*a*) Puerperal ulcers of the vagina arise from infection of abrasions and lacerations acquired in labor. A diphtheritic membrane of a gray or yellowish-gray color forms over the ulcerated surface. The lesion may extend deeply into the vaginal wall and into the paravaginal connective tissue. Pelvic abscesses and suppurative peritonitis may follow from extension of the infection. A diffuse tumefaction and reddening of the vaginal mucous membrane may extend from the ulcers, giving the appearance of erysipelas. Stenosis and atresia of the vagina may follow healing by cicatrization, particularly when the paravaginal tissues are involved.

(*b*) True diphtheritic ulcers of the vagina, in which the Klebs-Loeffler bacillus appears, is a rare finding, and almost always develops during the puerperium.

(*c*) Tuberculous ulcers of the vagina are of rare occurrence. Such ulcers are shallow, with irregular undermined margins. The base and margins are studded with miliary tubercles, in which the tubercle bacillus may be demonstrated.

(*d*) Syphilitic ulcers in the primary stage, with elevated indurated margins, are more common than those of the secondary or tertiary stage. Ulcers of the vagina complicating the infectious diseases, as, for instance, typhoid fever and smallpox, are occasionally seen.

(*e*) Decubitus ulcers arising from pressure by foreign bodies in the vagina show great variation in extent and form. The common cause of decubitus ulcers is the wearing of ill-fitting pessaries, which, through pressure, cause a superficial slough of the mucosa. The necrosis may extend deep into the tissues and result in the development of a vesico-vaginal fistula. Such ulcers may attain the size of a saucer.

3. Tuberculous Vaginitis.—But one case of primary tuberculosis of the vagina has been reported (Friedländer). The usual tuberculous lesions are found—that is to say, local or general dissemination of tubercles, larger tuberculous nodules, and caseous masses with ulcers. The microscope reveals the usual structure of tubercles: giant cells, small round cells, endothelioid cells, and tubercle bacilli.

By far the greater number are secondary to tuberculosis of the uterus, tubes, vulva, cervix, rectum, and bladder. The infection may rarely be conveyed by the blood. Primary infection may be acquired by direct infection from the husband and from the examining finger and instruments.

4. Emphysema Vaginæ (*Colpitis Emphysematosis*).—As the result of some sort of an infection, numerous small cysts filled with gas are found in the subepithelial connective tissue. The lesion is most frequently seen in pregnancy and the puerperium. As a rule, the cysts disappear within three months after labor.

Wenkel first described them as retention cysts formed from vaginal glands. Zweifel first demonstrated them to be the result of fermentation. Eisenlohr proved the presence of gasogenic bacteria in the connective-

tissue spaces of the submucosa and of the lymph spaces. There can be no doubt as to the microbic origin of the lesion. Through a speculum the vesicles appear dark bluish red in color. Pressure causes them to temporarily disappear. If the vagina is partly filled with clear fluid and the vesicles punctured with a needle, gas will escape in bubbles.

5. Condylomatous Vaginitis.—Groups of warty excrescences are found in the vagina as a further extension of a similar growth of the vulva. The whole vaginal surface may be covered with the warty growths.

6. Senile Vaginitis.—A form of vaginitis that is characterized by the formation of adhesions between the vaginal walls and between the vaginal walls and cervix is often seen in old age. The vaginal epithelium becomes devitalized and desquamated, thus rendering the tissues susceptible to infection. The symptoms complained of are leucorrhea, painful intercourse, a feeling of weight in the pelvis, and the occasional loss of a moderate amount of blood.

On examination through a vaginal speculum, the mucous membrane of the vagina is found to be pale and glistening, the rugosities are lost, and here and there are seen excoriated areas. The vault of the vagina is irregularly obliterated by adhesions which usually separate readily, leaving a raw, bleeding surface. In well-advanced cases the entire vaginal cavity may be obliterated by firm adhesions.

Clinical Diagnosis.—In all forms of vaginitis there is an excessive secretion, varying in quantity and character. The secretion is derived in part from the uterus and cervix. It is serous, mucous, or purulent. This so-called leucorrhea ("whites") is usually the first symptom. Following this is itching and burning, which is aggravated by exercise. When caused by gonorrhea these symptoms may appear within twenty-four hours from the time of the infection. In addition to the above symptoms there is usually burning and smarting on urinating, caused by a urethritis.

When pus can be expressed from the urethra, the diagnosis of gonorrhea is made with reasonable certainty. If in addition the Bartholinean glands are infected there can be little doubt as to the gonorrheal origin of the lesion.

Vesical and rectal tenesmus are present in the acute stage. In the mild forms and in the chronic stage the patient may not complain.

The diagnosis has to do, first, with the recognition of the vaginitis; next, with the possible extension of the lesion to neighboring structures; and, finally, with the underlying cause of the infection.

Direct inspection should determine the presence of vaginitis. The Sims speculum should be used with the patient in the Sims position. There is more or less sensitiveness to the touch of the examining finger, and a roughness of the surface may be detected.

The recognition of extension to the upper genital tract involves the diagnosis of endometritis and salpingitis. To determine whether the secretion is from the vagina or from the uterus the Schultze method is employed. The vagina is cleansed with a douche of sterile water,

a plug of sterile cotton is placed against the cervix, and after remaining there several hours it is removed. If the secretion is collected on the top of the plug, the discharge comes from the uterus; if it collects around the plug, the discharge is from the vagina.

Recognition of the cause of the infection is not always possible. Gonorrhea is so frequently the cause that it must first be excluded before considering other possible causes. In the acute stage the gonococcus can usually be found in the secretion, but not often in the chronic stage. When beginning a few days after marriage and when associated with burning on urinating, it is highly probable that gonorrhea is the underlying cause.

Treatment.—The treatment of vaginitis is best discussed under the headings of acute and chronic forms.

Acute Vaginitis.—Rest in bed is the most important desideratum in the management of acute cases. It should be enjoined throughout the entire acute stage.

Cleanliness must be maintained if the disease is to be prevented from passing into a chronic state. For this purpose vaginal douches are given two or more times daily. Aside from the mechanical cleansing effect of the douche, an antiseptic added to the sterile douche water will materially lessen the inflammatory reaction by destroying the pathogenic microörganisms lying within the vagina. For this purpose the author prefers formalin in the proportion of 1 to 2000. The douche should be given in the recumbent position and at a temperature of 110°. About four quarts of solution should be used.

Local applications are effectively applied to the vaginal mucosa. For gonorrheal vaginitis the silver salts are preferred. In the early part of the acute stage, antiseptic vaginal douches alone should be given. As the acute stage subsides, 2 ounces of a 4 per cent. solution of silver nitrate may be poured through a cylindrical speculum into the vagina and repeated every three to seven days. Each night a tampon of absorbent cotton, saturated with a 25 per cent. solution of argyrol or protargol, should be inserted and left overnight.

Astringent powders have been used with good effect as a dusting powder to the vaginal mucous membrane. These powders are calomel, boric acid, and bismuth, used singly or in combination. They are applied after cleansing the vagina with a douche and drying the surface with sterile swabs of cotton. A half-ounce of the powder is introduced on the top of a dry tampon of sterile absorbent cotton. The treatment should be repeated three or four times a week for an indefinite period. When there is a tendency to the formation of adhesions, the surfaces should be kept apart by vaginal packs of antiseptic gauze.

In ulcerative vaginitis, aside from antiseptic vaginal douches, the ulcers should be cauterized with a 20 per cent. solution of silver nitrate or with the Paquelin cautery.

In emphysematous vaginitis, antiseptic douches should be given cautiously during pregnancy. The temperature should not exceed 100°, low pressure should be maintained, and the duration of the

douche should not exceed five minutes. These precautions should be taken in view of the danger of interrupting pregnancy.

In the absence of pregnancy, emphysematous vaginitis may be treated with prolonged hot antiseptic douches and the nightly application of glycerin and ichthyol tampons.

Condylomata Acuminata.—Excision followed by cauterization is the most effective means of treatment. This usually requires a general anesthetic.

When operation is contra-indicated for any reason, local application of equal parts of calomel and salicylic acid may be tried as a dusting powder, though the results are not, as a rule, satisfactory.

When complicating pregnancy the condylomata should not be removed before labor for fear of interrupting pregnancy. Sitz baths are of value in relieving pain; they may be given one or more times daily. Dilute lactic acid has been applied with good results.

Chronic Vaginitis.—Little progress may be made in the treatment of chronic vaginitis so long as the exciting cause exists. It is therefore essential that the irritating, infectious discharges from the uterus be removed; that foreign bodies within the vagina, such as tumors and pessaries, be removed, and above all that cleanliness be maintained.

Rest.—It is not required, nor is it advisable, that rest in bed be enjoined. Well-regulated exercise and fresh air are of value. Sexual rest, however, is essential to a good result.

Diet.—The food should be nutritious and easily digested.

Bowels.—Constipation must be prevented by the use of mild cathartics and the regulation of the diet.

Local Applications.—When the vaginitis is of gonorrheal origin, douches of formalin, 1 to 4000, should be given twice daily. The vagina should be packed with sterile gauze or cotton tampons saturated with a 25 per cent. solution of argyrol or protargol. These packs are best introduced at bedtime and removed in the morning. They may be repeated nightly for an indefinite period. If the inflammatory reaction does not subside readily, the vaginal walls should be swabbed freely once a week with a 10 per cent. solution of silver nitrate. Before swabbing with silver nitrate, the vaginal cavity should be loosely packed with an antiseptic gauze; this should be allowed to remain for twenty-four hours. It is seldom necessary to continue the applications of silver nitrate more than six weeks, but the vaginal douching of formalin should be continued for a much longer period.

Active treatment should not be discontinued until all evidence of inflammation has disappeared. In gonorrheal infections the one reliable test of cure is the repeated bacteriological examination of the vaginal secretions, with negative findings.

Paravaginitis.—By paravaginitis is understood an inflammation involving the connective tissue immediately surrounding the vagina. As a rule, it is a staphylococcus infection leading to the formation of localized abscesses. Other possible causes are wound infections following operations and attempts to induce abortion; ill-fitting pessaries, which

have ulcerated through the vaginal wall; infectious diseases, such as dysentery and typhoid fever, where the infection is conveyed through the bowel or bladder into the paravaginal connective tissue, and in inflammatory diseases of the rectum and bladder extending to the vagina.

Veit describes a peculiar form which he designates as paravaginitis phlegmonosa dessicans. But few cases have been recorded. One was ascribed to gonorrhea; others may have been due to criminal abortion, and in two instances no cause was assigned. Undoubtedly the lesion may arise as a complication of contagious and infectious diseases. Cicatricial contraction of the vagina is the final result.

Vaginismus.—Vaginismus is a term applied to a condition in which there are spasmodic contractions of the vulvovaginal orifice. These spasms may involve the levator ani muscles, the thighs, and occasionally the muscles of the body in general.

Causes.—Vaginismus is a symptom, not a disease. It is due to local causes, though neurotic individuals are more often affected, and it is assumed that their general nervous state has much to do with the condition.

1. *Traumatisms.*—Injuries sustained in coitus, with subsequent irritation, are common causes. In this manner the hymeneal tags become irritated, and excoriated areas and fissures appear at the vulvovaginal orifice, and, as a result, vaginismus develops.
2. Urethral caruncle.
3. Fissures in the fourchette, urethra, and rectum.
4. Inflammations of the vulva, vagina, cervix, bladder, urethra, and rectum.
5. Coccygodynia.
6. Masturbation.
7. Excessive venery.

Symptoms.—The spasm may develop gradually or suddenly, and may be confined to the vulvovaginal outlet or may assume general convulsive movements. Cases may be so exaggerated as to preclude intercourse and digital examinations. As a rule, women suffering from vaginismus become hysterical and are poorly nourished. Most of them are sterile.

Diagnosis.—No difficulty will be experienced in making a diagnosis. The patient describes the spasm, and upon attempting to make a digital examination, the spasms will be produced. Unless treated these cases tend to become worse, but with proper treatment the prospect for cure is good.

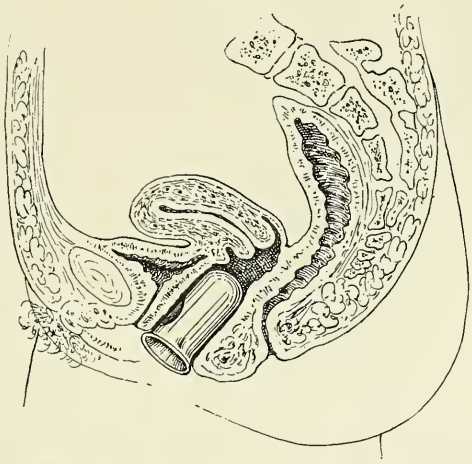
Treatment.—When a cause can be found it must be removed. It is not always possible to demonstrate a cause and then the treatment is directed to the existing symptoms. Furthermore, with the removal of the cause, the spasms will often continue unless the vulvovaginal outlet is thoroughly stretched.

Tentative Treatment.—In mild cases a 2 to 5 per cent. solution of cocaine may be applied by means of a pledget of absorbent cotton

to the affected surface. By this means the irritability may subside and the conditions made favorable for intercourse. Hot sitz baths are useful in relieving the spasms. A 4 per cent. solution of silver nitrate, applied to the affected surface twice a week, will sometimes give permanent relief. The general condition of the patient must receive due consideration. To this end a psycho-analysis should be made and psychic treatment administered. The habits of life should be carefully regulated, in view of improving her general health. While under treatment all sexual excitement must be avoided.

Radical Treatment.— *Dilatation.*—In severe and intractable cases there must be overstretching of the vagina and vulvar outlet. This may be accomplished slowly and without an anesthetic by cocainizing the vulvovaginal outlet and passing lubricated graduated bougies. By patiently persisting over a period of several weeks a cure may be effected.

Fig. 288



Glass plug in the vagina, inserted to retain the patency of the vagina following operation for atresia and vaginismus.

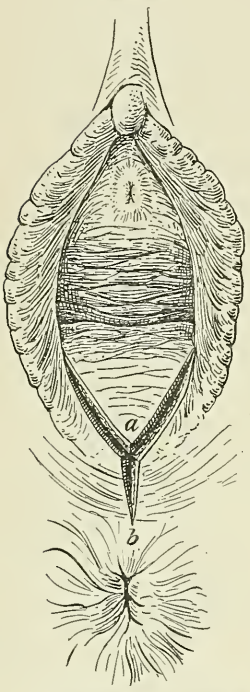
Forcible Dilatation under General Anesthesia.—A general anesthetic is given and the vulvar outlet is stretched with the thumbs to the point of yielding. A Sims glass vaginal plug is then introduced that is sufficiently large to keep the structures on the stretch. This plug should be worn continuously for one week, then removed, and inserted for an hour night and morning for about one month. If the patient experiences difficulty in inserting the plug, the parts may be rendered insensitive by the application of cocaine (5 per cent.).

Incisions.—When forcible stretching fails, an incision is made in the median line from the vaginal entrance to a point in the perineum midway to the anus. An incision one and a half inches long is next made into either vaginal sulcus and converging at the median incision in the perineum. These incisions should extend through the superficial

fascia and underlying muscle fibers. Interrupted catgut sutures (No. 2 chromic) are passed from above downward, uniting these structures.

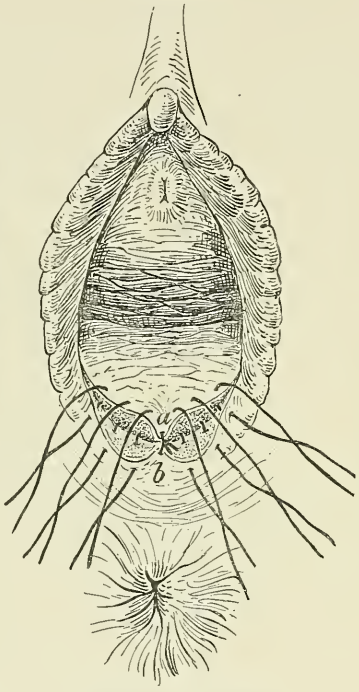
Treatment with a Hydrostatic Bag.—In place of specula and dilators the Champetier de Ribes bag, such as is used in obstetrical practice, may be employed with good effect.

Fig. 289



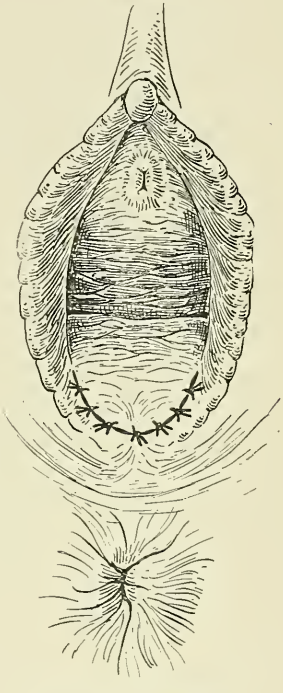
Operation for vaginismus. Step 1.

Fig. 290



Operation for vaginismus. Step 2.

Fig. 291



Operation for vaginismus. Step 3.

A general anesthetic is given and a bag, 5 to 6 cm. in diameter, is introduced and gradually distended with water. Care should be taken not to stretch the vaginal walls to the point of rupture. When filled, traction is made upon the bag until the perineum stretches. The water is then removed from the bag and the bag extracted.

A second bag, 6 to 7 cm. in diameter, is next inserted and the process of stretching repeated. After removal of the bag the vagina is snugly packed with iodoform gauze for twenty-four hours, after which daily vaginal douches are given. The advantage of this form of treatment rests in the thorough stretching of not only the vaginal walls but the pelvic floor as well.

CHAPTER XIX

INFLAMMATIONS OF THE UTERUS

- Endocervicitis (Endometritis Cervicalis)
- Erosions of the Cervix
  - Simple
  - Papillary
  - Follicular
- Ulcers of the Cervix
  - Decubitus
  - Tuberculous
  - Cancerous
- Tuberculosis of the Cervix
- Endometritis
  - Clinical Classification
    - Acute
    - Chronic
      - Hemorrhagic
      - Catarrhal
      - Dysmenorrheic
      - Tuberculous
      - Gonorrheal
      - Decidual
      - Puerperal
      - Postabortive
      - Exfoliative
      - Senile
  - Anatomical Classification
    - Macroscopic
      - Hypertrophic
      - Fungous
      - Villous
      - Polypoid
      - Ulcerative
      - Pseudodiphtheritic
    - Microscopic
      - Glandular
      - Interstitial
- Chronic Metritis
- Abscess of the Uterus
- Treatment of Inflammation of the Uterus
  - Acute Metritis
  - Chronic Metritis
  - Endocervicitis
  - Erosions of the Cervix

ENDOCERVICITIS (ENDOMETRITIS CERVICALIS)

Endocervicitis is an inflammatory lesion confined to the cervical canal. Part or all of the cervical endometrium may be involved, the extent of the lesion varying from a mere inflammatory zone about the external os to a diffuse inflammation of the entire surface, extending above to the internal os and below to the external os.

The diagnosis should not be difficult, because of the accessibility of the lesion to direct inspection and exploration. The color of the inflamed mucosa varies from a bright red to a dull cyanotic hue. The surface may be smooth, but is more often granular or papillary. The arbor vitæ are rounded and partially obliterated. By touching the surface with the finger or sound, slight bleeding may be excited, and it is even possible for spontaneous bleeding to occur. Tenacious, glairy mucus covers the surface and may effectually plug the cervical canal. The mucus accumulating within the cervical canal may cause pressure atrophy of the mucosa, and thus dilate the canal. The secretion may be clear, transparent mucus, or it may be milky from the addition of leukocytes and epithelium.

Mucous polyps of inflammatory origin protrude from the mucosa into the cervical canal and out through the external os into the vagina.

Microscopic examination of scrapings from the cervix is unsatisfactory, for the reason that the surface epithelium and glands are firmly embedded in connective tissue and are not readily scraped away, as is the endometrium of the uterine body. As in endometritis, we find in the cervix two microscopic forms—the glandular and interstitial.

Fig. 292

Mucous polyp of the cervix, showing transformation of the columnar epithelium into stratified squamous epithelium. The condition may be mistaken for malignant degeneration.

EROSIONS OF THE CERVIX

An erosion of the vaginal portion of the cervix is a mucous patch consisting of a layer of columnar epithelium and newly formed glands lying beyond the external os and replacing squamous stratified epithelium. Formerly, erosions of the cervix were believed to be true ulcers, and were vulgarly called "ulcers of the womb." We are indebted to Ruge and Veit for the demonstration of their true character. The red or bluish color of the mucous patch is in marked contrast to the surrounding pale and smooth vaginal epithelium. The margins are irregular but sharply circumscribed. The extent of the lesion is variable. In nulliparæ there is usually a mere zone about the external os, while in

PLATE XIX

Healed Follicular Erosion of Cervix, with Normal Mucosa in the Body of the Uterus.

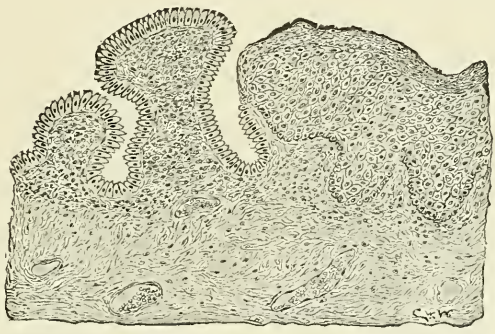
multiparæ the erosion may extend for some distance upon the vaginal portion of the cervix and even to the vault of the vagina. Isolated patches may be seen on the vaginal portion of the cervix, with normal vaginal epithelium intervening.

Classification.—Erosions may be classified as simple, papillary, and follicular.

Simple Erosion.—Simple erosion has a smooth surface covered with a single layer of columnar epithelium. Newly formed glands may dip into the underlying connective tissue.

Papillary Erosion.—Papillary erosion, as the name implies, presents a papillary surface. In addition to the surface layer of columnar epithelium, there are deep invaginations in the form of glands alternating with elevations composed of new-formed connective tissue and round cells. The new-formed cells vary greatly in number and size and secrete abundant mucus. The papillary elevations are in direct proportion to the connective-tissue hyperplasia and round-cell infiltration.

FIG. 293



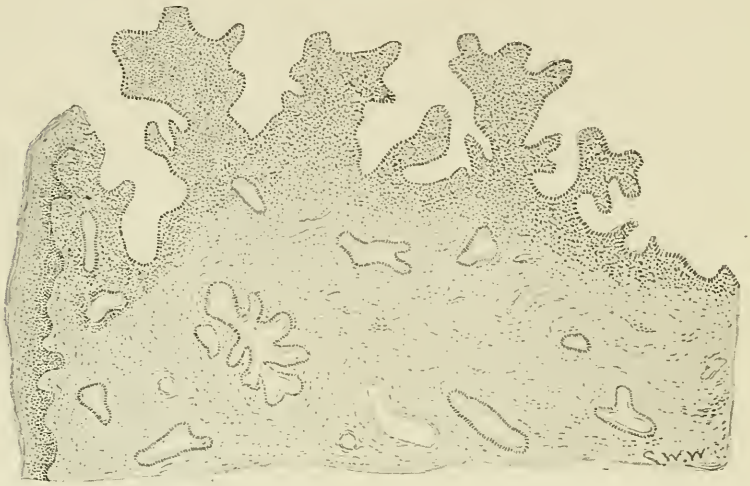
Transition of squamous epithelium of vaginal portion to columnar epithelium of the cervical canal. (Abel.)

Follicular Erosion.—Follicular erosion is characterized by the presence of retention cysts, the so-called "Nabothian follicles." These retention cysts arise from the occlusion of the mouths of the new-formed glands in the erosion. They are filled with inspissated mucus. To the touch of the examining finger they are likened to the feeling of shot under the skin; to the eye they appear as rounded elevations of a gray, blue, or yellow color. In number they range from one to a score or more, and may attain the size of a hen's egg, though it is unusual for them to distend to a size larger than a hazel-nut. The epithelium lining the cyst becomes flattened and may be entirely lost.

The Healing of Erosions.—We speak of incomplete and of complete healing of erosions. By this is meant the replacing of the mucous patch with squamous epithelium. In complete healing of an erosion, the surface epithelium and the glands of the erosion are completely replaced by squamous epithelium, thereby restoring the vaginal portion of the epithelium to its normal integrity. In incomplete healing of an

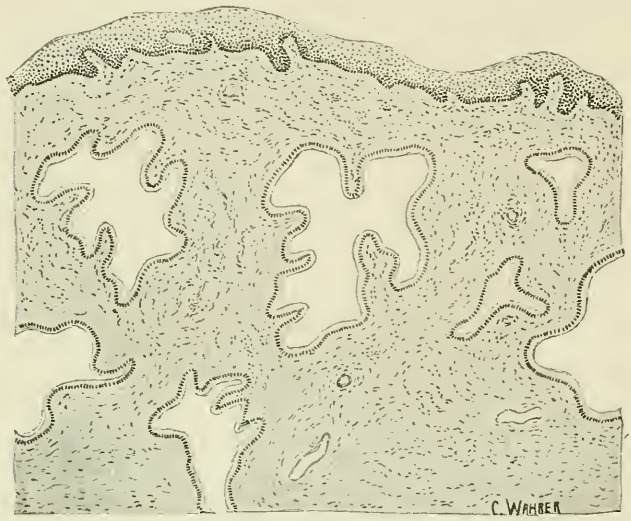
erosion, the columnar epithelium on the surface of the erosion is replaced by many layers of squamous epithelium, similar to that of the surrounding vaginal mucosa. The glands beneath are not obliterated, but are

FIG. 294



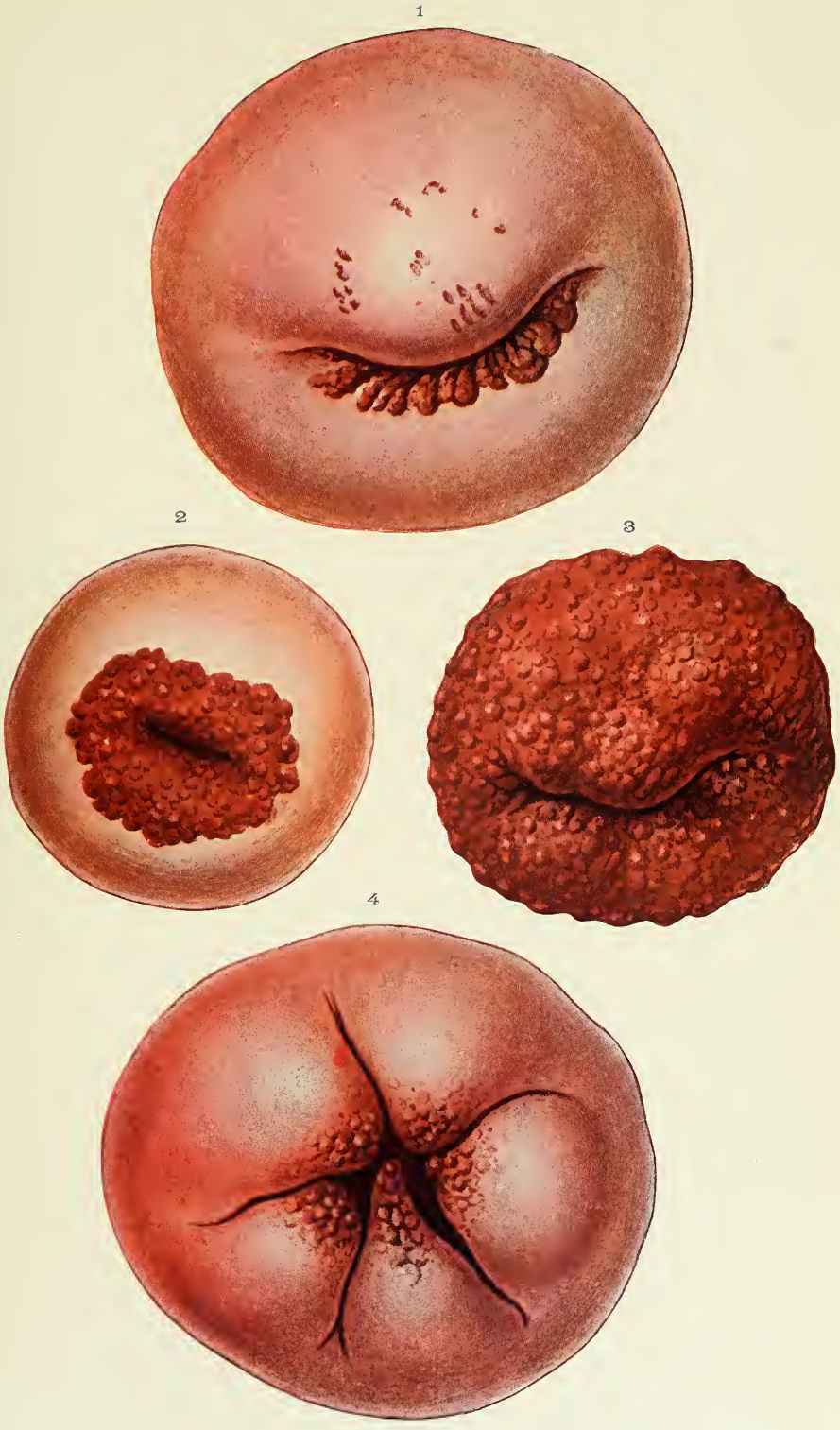
Papillary erosion of the cervix. The squamous epithelium has been partially replaced by columnar epithelium. The surface is uneven and papillary. The tissue is deeply infiltrated with small round cells, and new glands are formed by the invagination of the surface epithelium.

FIG. 295



Incompletely healed erosion of the cervix. Mucous secreting glands are locked in by many layers of squamous epithelium. Formerly the surface was covered by a layer of columnar epithelium from which the glands dipped into the connective tissue. The surface epithelium became transformed into stratified squamous epithelium and the glands were buried beneath.

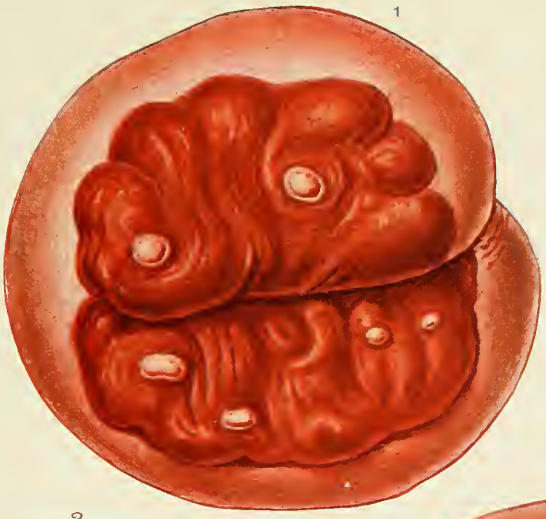
PLATE XX



Erosions of Cervix.

1. Hyperemia of cervix.
2. Simple erosion.
3. Papillary erosion.
4. Simple erosion with stellate laceration.

PLATE XXI



Erosions of Cervix.

1. Follicular erosion.
2. Follicular erosion.
3. Mucous polyp of cervix.
4. Papillary erosion.

either locked in beneath the squamous epithelium or open directly upon the surface, now covered with squamous epithelium. Healing of an erosion is effected by metaplasia of the cylindrical epithelium into many layers of squamous epithelium (Fig. 295).

Differential Diagnosis of Endocervicitis.—A clinical diagnosis of endocervicitis is commonly made from the mucous or mucopurulent secretion coming from the cervix. It is well to discriminate between a hypersecretion of the cervix due to passive congestion and a secretion which is the expression of an infection. This, however, is not always possible. A mucous secretion seen to leave the cervical canal must

FIG. 296

Incomplete healing of an erosion of the cervix. Between two sections of stratified squamous epithelium is a limited amount of columnar epithelium which is invaginated in the form of irregular glands. Numerous glands are locked in beneath the squamous epithelium. In this case the surface was originally smooth and covered with stratified squamous epithelium; the squamous epithelium became destroyed and replaced by a single layer of columnar epithelium, from which glands were formed. Subsequently, through a healing process, part of the surface epithelium was transformed into stratified squamous epithelium and the glands were covered over, as seen above.

necessarily come from the cervix, there being no mucus in the secretion of the uterine body or Fallopian tubes. When pus is mixed with the mucus there can be no doubt as to the infectious origin of the secretion.

Erosions of the cervix may closely simulate carcinoma. The macroscopic appearance may be identical. The differential diagnosis is given in Chapter XXVII. (See Plates XIX, XX, and XXI.)

Ectropion of the lips of the cervix may closely resemble erosions. If the lips of the cervix are grasped by tenacula and approximated, the reddened surface will roll into the cervical canal and disappear. If an erosion is present there will be no disappearance of the reddened zone.

ULCERS OF THE CERVIX

True ulcers of the cervix are of rare occurrence. Formerly erosions were regarded as such.

Decubitus Ulcers.—Decubitus ulcers of the cervix are found in prolapse of the uterus and as the result of ill-fitting pessaries. Such ulcers may attain the size of a silver dollar. They are usually superficial, with irregular outlines; the margins are not elevated; the base is granular, firm, and covered by a grayish-yellow secretion. The tendency to bleed is not great, as compared with malignant ulcers. Furthermore, in contrast with carcinoma, there is a marked tendency to cicatrization. Under the microscope the epithelium is seen to be lost. The base is thickly beset with distended capillaries embedded in the meshes of connective tissue and small round cells. This round-cell infiltration extends a variable distance into the underlying connective tissue. A structureless, necrotic material may collect upon the base of the ulcer.

Tuberculous Ulcers.—Tuberculous ulcers will be described below.

Cancerous Ulcers.—(See Chapter XXVII.)

TUBERCULOSIS OF THE CERVIX

Tuberculosis of the cervix as a primary lesion is a rare finding. Beyea found sixty-eight cases of primary tuberculosis of the cervix in the literature, and adds a single case. In nine of these cases the lesion was confined to the cervix; in the balance there was an invasion of adjacent structures. The greatest number occurred between the ages of twenty-one and forty years; the extreme ages were seventeen and seventy-nine. Beyea divides the pathological forms into the ulcerative, hyperplastic, and miliary.

Tuberculous ulcers of the cervix may follow primary tuberculous infection of the endometrium; or, as is more often the case, a primary infection of the tubes, with subsequent extension downward to the uterus and cervix. The diagnosis must be based upon the finding of giant cells, tubercles, and of tubercle bacilli in and about the ulcers. The margins of a typical tuberculous ulcer are irregular and undermined; the base of the ulcer is uneven and tends to heal by cicatrization.

Miliary tuberculosis of the cervix has seldom been recognized. In general, it may be said that tuberculosis of the cervix closely resembles erosions and cancers. A positive diagnosis can only be made by the aid of the microscope. The clinical history and the finding of tuberculosis elsewhere in the body, particularly in the upper genital tract, is of importance in the consideration.

ENDOMETRITIS

Hitchman and Adler propose a radical change in the classification of endometritis. The author is in accord with the statement of Frank,

that these authors have performed a valuable service in claiming that the majority of changes hitherto classed as chronic glandular or interstitial endometritis are physiological and not inflammatory in origin—that they are the changes normally found in the menstrual cycle. But Frank believes that they have gone too far in their conclusions. While the presence of plasma cells does indicate an inflammatory process, their absence does not necessarily exclude the possibility of inflammation.

Matthews Duncan once said in a lecture: "Who can tell what anyone means by endometritis? Often its use is the parent or child of ignorance and confusion." There is yet to be proposed an exact and practical classification of endometritis. In the light of present knowledge we are unable to harmonize our clinical, macroscopic, and microscopic forms of endometritis. In making a diagnosis from prominent symptoms and evident etiological factors, we are unable to foretell the naked-eye and microscopic findings. One and all of the pathological forms of endometritis may exist without clinical signs. On the other hand, any of the pathological lesions of the endometrium may give the same clinical manifestations as endometritis. Furthermore, these symptoms may be present in the absence of an evident pathological change in the endometrium.

It is evident that a clinical classification cannot be universally applied. While appropriate in the majority of cases, there will be a minority which can only be recognized by direct examination of the endometrium with the naked eye or with the microscope. Indeed, it not infrequently occurs that the absolute diagnosis is reserved for a microscopic examination of scrapings removed by the curet. In view of what has been said we will give both a clinical and an anatomical classification.

Clinical Classification of Endometritis.—Endometritis may be acute or chronic. The distinction between these forms is usually not difficult to make.

Acute Endometritis.—In acute infections of the endometrium, the constitutional disturbances may be mild or severe. Fever may exist, but is not always proportionate to the extent and intensity of the inflammation. The pulse-rate corresponds to the degree of general intoxication, and is to be regarded as a more reliable indication of systemic infection than is the temperature. The menses are lessened or suppressed. The uterine discharge is at first serous, later seropurulent. There is backache, nausea, a sense of weight in the pelvis, rectal and vesical tenesmus, and pain in the hypogastrium. Bimanual examination reveals a uterus tender to pressure, not perceptibly increased in size, and perfectly movable. The external os may be slightly patulous and softer than normal. Inspection through the speculum shows a congestion of the cervix which is particularly evident at the external os. From the cervical canal flows a seropurulent or mucopurulent secretion; it is seldom clear, serous, or mucous. A sound introduced into the uterus would cause some pain and bleeding, and should not be used.

Chronic Endometritis.—For practical clinical purposes we will adopt a classification of endometritis based upon the prominent clinical symptoms—hemorrhage, leucorrhea, and pain, and will speak of hemorrhagic, catarrhal, and dysmenorrheic endometritis.

Clinical Forms of Chronic Endometritis.—1. *Hemorrhagic endometritis* is characterized by an unusual loss of blood during and sometimes between the menstrual periods. Inasmuch as the normal limits of menstruation vary widely, it is difficult to fix the exact limitations of the normal and the abnormal flow of blood. The normal limit in time may be fixed at from two to eight days; a flow continuing longer than eight days may be regarded as pathological. The average normal quantity of menstrual blood is six to eight ounces. Intermenstrual bleeding is always pathological and demands careful inquiry into the cause. It is unusual for endometritis to cause intermenstrual bleeding. Physical exertion may excite hemorrhage, but the loss of blood is never considerable. In hemorrhagic endometritis, leucorrhea and pain may be present, but these are symptoms of less prominence than the hemorrhage.

2. *Catarrhal endometritis* is characterized by an excessive serous or seropurulent discharge from the uterus. The amount of secretion is not proportionate to the extent and degree of inflammatory changes found in the endometrium. If mucus is found in the secretions, the cervix is involved, there being no mucous secretion from the body of the uterus.

To differentiate a uterine discharge from the secretions of the vulva and vagina the Schultze method should be adopted. (See page 409.)

Not infrequently women complain of a leucorrheal discharge during pregnancy and immediately preceding and following the menstrual flow. Such are within normal limits, and are to be regarded as hypersecretions of the congested uterus, vagina, and vulva.

The most excessive discharge is found in gonorrheal endometritis. Nothing can be ascertained respecting the essential cause of the infection from the macroscopic appearance of the discharge. Cover-slip preparations may contain the gonococcus.

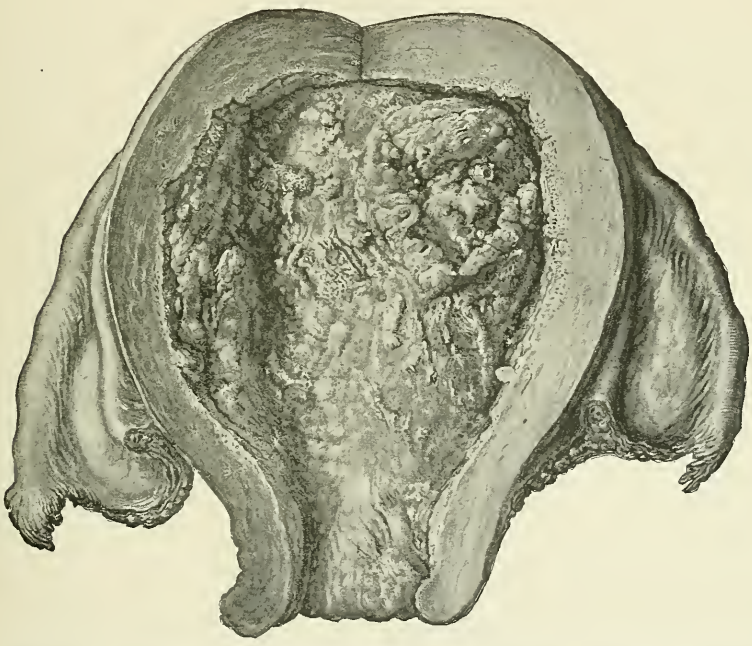
3. *Dysmenorrheic endometritis* is characterized by painful menstruation. Pain is little to be relied upon in the diagnosis of endometritis. The diagnosis is arrived at by excluding all other possible causes of pain. The pain of endometritis is described as being of a cramping, bearing-down character, and associated with a feeling of weight in the pelvis. However, there is nothing characteristic in the pain. It is more often caused by such complicating lesions as salpingitis, ovaritis, and perimetritis.

While the above-named symptoms—hemorrhage, leucorrhea, and pain—are commonly present in endometritis, and while one of the three symptoms usually dominates and justifies the terms as given above, it is not uncommon for endometritis to give rise to no symptoms. Furthermore, carcinoma, sarcoma, submucous polyps, and retained placental tissue may closely simulate endometritis in their clinical manifestations.

In addition to the above clinical forms of endometritis, may be mentioned several varieties which are not only hemorrhagic, catarrhal, or dysmenorrheic, but are deserving of special designation because of some point of interest relating to their etiology, time, and manner of occurrence. The following forms are ordinarily recognized:

4. *Tuberculous endometritis* often follows a primary infection of the tubes. When tuberculous salpingitis is recognized, and there develops a catarrhal discharge from the uterus, the extension of the tuberculous process to the endometrium is suspected. Frequently there is amenorrhea. Cover-slip preparations should be taken from the secretions and an exploratory curettage may be made, with the view of finding giant cells, tubercles, and tubercle bacilli in the scrapings.

FIG. 297



Uterus from a patient dying on the tenth day from a mixed infection—streptococci and colon bacilli. (Jewett.)

5. *Gonorrheal endometritis* can be recognized with certainty only by finding the gonococcus in the catarrhal secretion. It is not always possible to demonstrate the presence of the gonococcus in the secretions; this is particularly true of the long-standing cases. When a leucorrheal discharge appears shortly after marriage, and when in addition to leucorrhea there is burning on urinating and infection of the urethra and glands of Bartholin, little doubt can be entertained as to the nature of the infection. No other form of endometritis causes such profuse discharge.

6. *Decidual endometritis* is a term applied to the inflammation of the endometrium of pregnancy. The lesion can only be suspected during pregnancy. A positive diagnosis is made by a microscopic examination of the decidua after the expulsion of the fetus. Gonorrhea is the usual cause. The symptoms are hemorrhage, which varies in amount and may continue throughout pregnancy; leucorrhea of a purulent character, less often serous, sometimes known as hydrorrhea gravidarum; and pain of a cramping or bearing-down character. The leucorrheal secretion ceases in the latter half of pregnancy when the decidua reflexa and vera unite. Decidual endometritis may arise prior to pregnancy, and is one of the potent causes of abortion.

Fig. 298

Uterus from patient dying on tenth day from a pure streptococcic infection. (Jewett.)

7. *Puerperal endometritis* occurs in the puerperium as the result of instrumental or digital infection. It is not infrequently of gonorrheal origin.

8. *Postabortive endometritis* follows abortions, usually as the result of instrumental or digital infection.

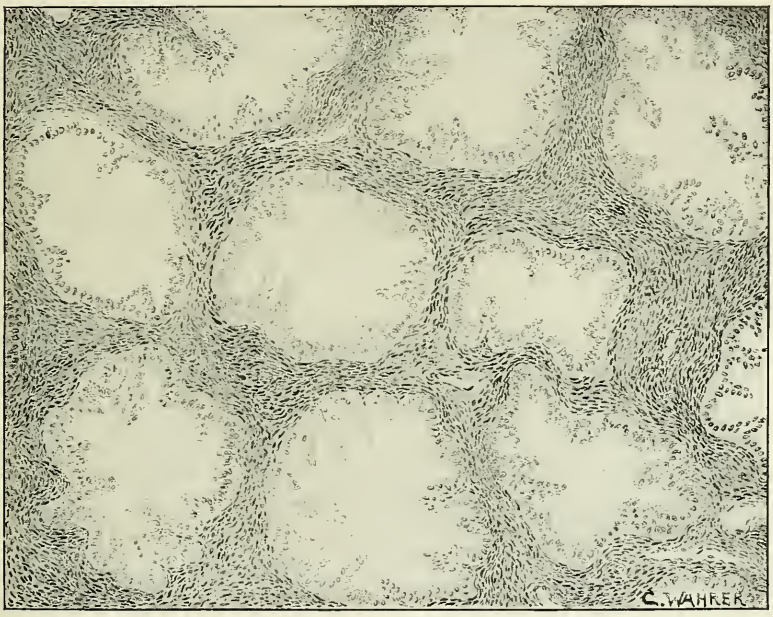
9. *Exfoliative endometritis* (membranous dysmenorrhea) is recognized clinically by the periodic expulsion of a membrane from the uterus,

either as a cast of the uterus or in the form of shreds. Expulsion of the membrane is commonly accompanied by severe pain. For differentiation of this variety from other discharged membranes see page 142.

10. *Senile endometritis,* as the name implies, occurs in advanced years, and in its clinical manifestations (hemorrhage, leucorrhea, and pain) may closely simulate carcinoma. There is no satisfactory explanation of the etiology of senile endometritis.

While the above forms are commonly recognized without difficulty, there is a minority of cases in which endometritis is only distinguished by anatomical (gross and microscopic) observations. It is evident that an additional classification, based upon anatomical findings, will serve when the clinical signs fail.

Fig. 299



Hypertrophic glandular endometritis. The endometrium is thickened, soft, and folded. In the cervix are several distended glands, forming a cystic protrusion.

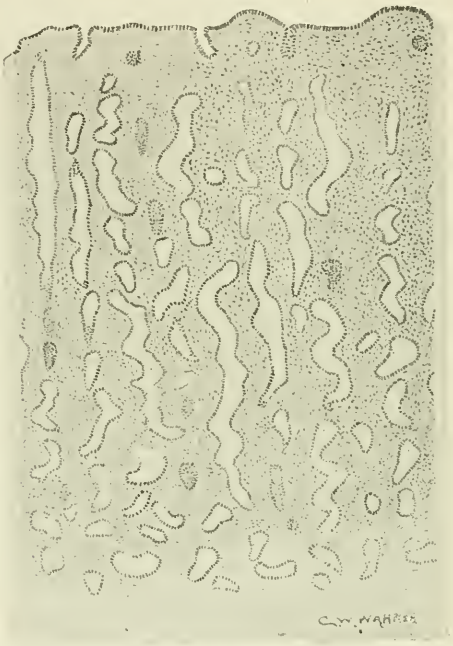
Anatomical Classification of Endometritis.—According to Hitschman and Alder, chronic endometritis exists only in the interstitial type, as expressed by the infiltration of the interglandular tissue by round cells, and that the plasma cells in this infiltrate alone are characteristic. They believe that the hypertrophic and hyperplastic glandular types are nothing but normal premenstrual findings. The author believes that their findings are justified to a degree, but prefers to hold to the anatomical classification of Ruge and Veit, which is here presented.

Macroscopic Forms of Endometritis.—Macroscopic forms of endometritis are diagnosticated after the uterus is removed and opened. Such findings may be wholly unsuspected in the absence of all clinical symptoms of endometritis. The following forms are recognized by the unaided eye:

1. *Hypertrophic endometritis,* in which the endometrium is thickened and soft.

2. *Fungous endometritis,* in which the endometrium is thrown into folds and fungosities.

Fig. 300



Normal endometrium of a young woman. The surface is covered with a single layer of low columnar epithelium. The glands are tubular, wavy, lined with columnar epithelium similar to that of the surface, and extend to the musculature. They run almost at right angles to the surface of the endometrium. The connective tissue is embryonal in type, and contains but few small bloodvessels, difficult to demonstrate.

3. *Villous endometritis,* in which the surface of the endometrium is covered with shaggy villosities.

4. *Polyphoid endometritis,* in which one or more mucous polyps project from the endometrium.

5. *Ulcerative endometritis,* in which true ulcers are formed in the endometrium. These ulcers show either a virulent form of infection or malignant degeneration.

6. *Pseudodiphtheritic endometritis,* following labor and abortion. On the surface of the endometrium is a necrotic layer formed of fibrin, degenerated epithelium, leucocytes, blood, and microörganisms.

Microscopic Forms of Endometritis.—The use of the microscope in the diagnosis of endometritis, already alluded to, affords the only means of making a positive diagnosis of these cases, for without its aid and relying upon clinical signs and symptoms, not only may the diagnosis and prognosis be faulty, but the uterus may be sacrificed in the treatment of what appeared to be a malignant growth. Furthermore, life may be sacrificed from failure to remove a malignant growth in which the characteristic symptoms were absent or suggestive of endometritis. In order that no serious oversight be made, it is important that a systematic microscopic examination be made of all uterine scrapings. Two general forms of endometritis are recognized by the microscope—the glandular and the interstitial. The two forms are commonly associated.

1. *Glandular endometritis* is characterized by an increase in size or number, or both, of the glandular elements. The surface of the endometrium is thrown into irregular elevations, forming folds, fungosities, villi, or polyps.

By the increase in size and number of the secreting epithelial cells, the glands become enlarged and irregular in their course. The interglandular spaces are decreased proportionately to the increase in the glandular elements. The glands, which in normal conditions rarely penetrate into the musculature, will, when hypertrophied, penetrate this region to a limited degree. The distortion of the glands may be extreme. In longitudinal sections the glands may appear to twist like a corkscrew. The inversion and eversion of the glandular epithelium may give a serrated appearance to the gland.

The glands are not only increased in size (hypertrophic glandular endometritis), but may be increased in number (hyperplastic glandular endometritis). The increase in the number of the glands is a result of the budding from preformed glands or of invaginations of the surface epithelium. If we fail to satisfactorily classify the established forms of endometritis, how much more difficult is it to draw the line sharply between inflammatory growths of the endometrium and true tumor formations.

Are we to recognize a benign adenoma of the uterus? Are the mucous polyps to be classified as newgrowths or as polypoid forms of endometritis? In short, is it possible to define the so-called hyperplastic glandular endometritis from benign adenoma of the endometrium?

Referring to general pathology, we are unable to distinguish hyperplastic glandular growths of inflammatory origin from benign adenomata. In reviewing the opinions of a number of authors, it becomes evident that to separate the two would be impossible, and to admit of a connecting link between the two lesions is admissible.

Rindfleisch, Chiari, Weichselbaum, and Orth favor the view of simple inflammatory hyperplasia to the exclusion of benign adenoma of mucous surfaces. Thoma, Eppinger, and Ponfick recognize adenoma, while others, as Van Heukelom and Birch-Hirschfeld, believe in the existence of a connecting link between these lesions. All believe in

the inflammatory origin of mucous polyps. Polyps of inflammatory origin are found in the stomach by Klebs. Birch-Hirschfeld, Petrow, and Landel describe diffuse and circumscribed growths of the gastro-intestinal tract due to catarrhal inflammation. By a careful analysis of their reports, it is evident that inflammatory hyperplasia of mucous surfaces merges insensibly into tumor growths, both benign and malignant. In a large percentage of their cases, carcinoma was associated in the same organ. In the urinary tract, Stoerck, Cahen, Rehn, and Kaufmann recognize papillomata of inflammatory origin.

Fig. 301

Normal endometrium of a woman in the postclimacteric period. The connective tissue is more compact and mature; the glands are small and far separated.

Le Count believes it to be fully demonstrated that there exists an imperceptible transition of hyperplastic processes of the tubal mucosa into those of true tumor growths, and that these may terminate in the production of benign tumors.

If then there is no unanimity of opinion among general pathologists, it is not surprising that the same discrepancy exists among gynecologists in reference to similar lesions in the endometrium.

We find Pozzi, Olshausen, Döderlein, Gebhard, and Ruge failing to recognize benign adenoma of the uterus, and classifying this lesion as inflammatory hyperplasia, reserving the term adenoma for malignant glandular growths.

The conclusion is that the two lesions cannot be clearly differentiated;

that a connecting link exists between them. Practically speaking, all are agreed that there exists a tendency on the part of inflammatory glandular growths to develop into benign and malignant newgrowths,

Fig. 302

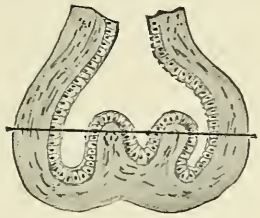


Fig. 303

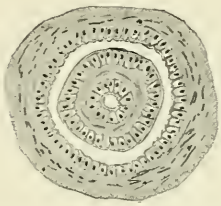


Fig. 304

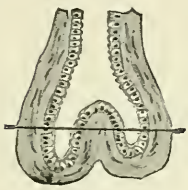


Fig. 305

Fig. 306

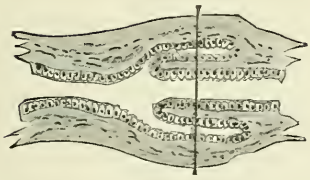


Fig. 307

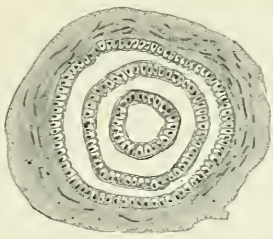


Fig. 308

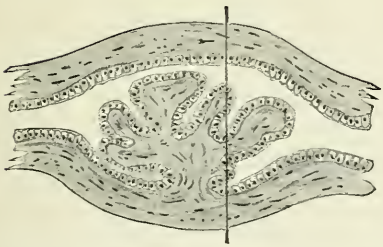
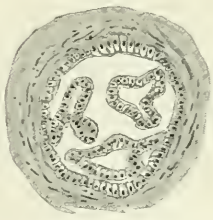


Fig. 309

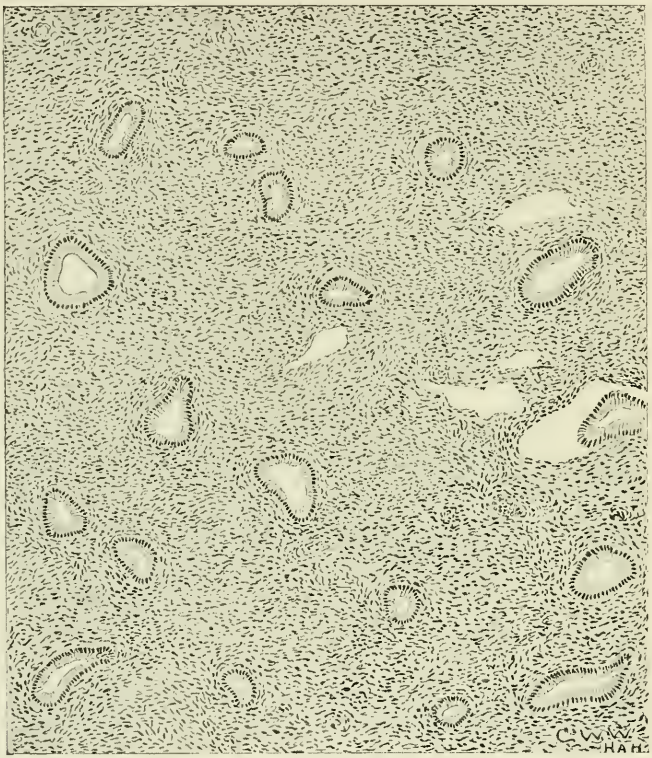


Explanation of scheme of gland invagination. Figs. 302 to 308 show longitudinal sections of invaginated uterine glands; Fig. 303 to 309 show cross-sections of the same gland. The glands shown in longitudinal section are each crossed by a line showing the plane at which the cross-sections are made. Fig. 302 shows the fundus of a gland invaginated with secondary eversion. Fig. 308 shows intraglandular papillary invagination of a gland epithelium from the side of the gland. Fig. 304 shows simple invagination of the fundus of a gland. Fig. 306 shows the inner and outer segments regular and the middle segment invaginated. (Amann, Mikroskopisch-Gynäkologischen Diagnostik.)

and when occurrring in old age, or when recurring after repeated curettage, they are to be regarded with suspicion.

The buds from parent glands may again and again give off new glands. We speak of an inverted gland when processes of the gland protrude into the lumen; of an everted gland when the processes protrude from the lumen. In the inverted gland cross-sections will give the appearance of a gland within a gland. (See the schematic

Fig. 310



Interstitial endometritis. The glands are decreased in size and far separated by mature connective tissue.

drawing, page 429.) More or less connective tissue invariably separates the glands—a fact to be remembered in differentiating this condition from malignant adenoma. In rare instances, two or more layers of epithelium are found on the surface of the mucosa or in the glands. Many layers of squamous epithelium have been observed. Such proliferating epithelium is always superficial, never passing beyond the basement epithelium, as in malignant glandular growths.

Spontaneous healing of glandular endometritis is possible though

not probable. At the time of the menopause the hypertrophied glands may diminish in size along with contraction of the interstitial connective tissue.

Fig. 311

Tuberculous glandular endometritis. Three giant cells are seen in the section. There is an extensive round-cell infiltration and degenerative changes.

2. *Interstitial endometritis* is characterized by a hyperplasia of the interglandular connective tissue at the expense of the glandular elements. Two stages are recognized—the acute and the chronic.

(*a*) *Acute Interstitial Endometritis.*—Acute interstitial endometritis presents a small round-cell infiltration in the stroma, which may be diffuse or circumscribed. The bloodvessels are congested and a serous or serosanguineous exudate permeates the connective-tissue spaces. The glands are crowded apart by the widening of the interglandular spaces. They are irregularly compressed, causing them to be greatly distorted. Healing may be perfect from absorption of the exudate, or the acute stage may gradually merge into the chronic.

Acute senile endometritis is described by Dunning, who presents the following summary of the anatomical findings: "The endometrium is thickened, the free surface is devoid of an epithelial covering; there is an increase in the vascularity with a peculiar arrangement of the small bloodvessels; there is a small round-cell infiltration; the glandular elements are diminished; the coats of the arteries of the muscularis are degenerated." The presence of diseased appendages in both cases reported by Dunning and of a mild form of pelvic peritonitis in one case seems to indicate that the inflammation tends to extend beyond the limits of the uterus.

(*b*) *Chronic Interstitial Endometritis.*—Newly formed connective tissue separates the glands. The glands are irregularly compressed and may suffer pressure atrophy. In place of the embryonal connective tissue normally found in the endometrium, there is matured fibrous tissue, which first thickens the endometrium and later contracts, resulting in a diffuse or localized atrophy of the mucosa. The surface of the endometrium becomes irregular. Retention cysts may appear in the endometrium from an obstruction at the outlet of the glands, causing the glands to distend with the secretions. In direct proportion to the distention of the glands, the epithelial cells lining them are compressed and may be quite flattened. The interglandular spaces may be greatly narrowed. When retention cysts are numerous, the term cystic glandular endometritis or cystic interstitial endometritis is applied.

When the connective-tissue spaces are filled and distended by a serous or serosanguineous exudate the term exudative interstitial endometritis is applied. Thus there may be a combination of these forms, and one may speak of a hypertrophic and hyperplastic cystic, exudative, glandular, and interstitial endometritis—a rather formidable name, but nevertheless suggestive.

Combinations of the glandular and interstitial forms of endometritis are the rule. It is unusual for either form to exist alone. Rarely are the glandular and interglandular tissues uniformly involved (diffuse endometritis).

The diagnosis of uterine scrapings in endometritis is preëminently satisfactory and reliable. The loose texture of the endometrium permits easy removal of the mucosa by the sharp curet. It is true that the structures composing the mucosa are more or less distorted in the scrapings, and that the deep layers of the endometrium are seldom found in the removed particles. When it is considered that the upper strata may show glandular changes and the lower strata interstitial

changes, or the upper strata show an inflammatory reaction and the lower strata malignant degeneration, it is evident that the microscopic examination of scrapings is not always reliable.

Little can be definitely learned from the naked-eye appearance of the scrapings. Large friable masses, homogeneous in appearance, of a pale gray color, suggest malignancy. In cystic formations the open spaces may be detected by the naked eye. In general it may be said that little that is positive can be learned from a macroscopic examination of particles removed from the uterus by the curet.

CHRONIC METRITIS

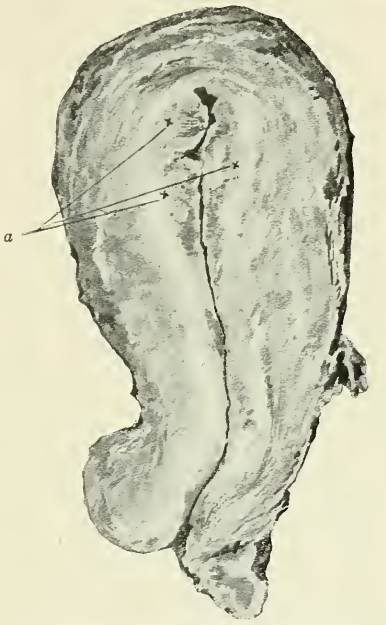
Endometritis can scarcely exist without more or less involvement of the uterine musculature. In acute affections the muscularis is congested and the connective-tissue spaces are filled with a serous exudate and a round-cell infiltration. Abscesses may develop in the connective-tissue spaces and infected thrombi may form in the blood-spaces.

In the chronic stage there is a development of connective tissue between the muscle fibers. As the connective tissue forms and contracts the muscle fibers atrophy, and through this process the uterus becomes very firm.

The diagnosis is based upon the uniform enlargement of the uterus and upon the change in its consistency. In the chronic stage there may be no tenderness on pressure.

Chronic metritis may be regarded as a clinical term signifying a uterus that is uniformly enlarged, firm in consistency, and one which has lost its normal flexibility.

FIG. 312



Chronic metritic uterus (natural size) removed from a patient, aged fifty-two years, who had had nine children, but no miscarriages. The symptoms were menorrhagia and metrorrhagia since last confinement, nineteen years ago. The last few weeks the hemorrhage had been almost continuous. Note the thickness of the endometrium. *a*, endometrium. (Donald.)

Chronic metritis is to be diagnosticated from interstitial fibroids. (See Chapter XXVI.)

ABSCESS OF THE UTERUS

Little has been written on abscesses of the uterine wall. Barrows collected forty-one cases from the literature and adds seven of his own. Doubtless many cases escape recognition. Some open spon-

taneously into the uterine cavity and are thought to be pus-tubes; others escape into the pelvic cavity or between the layers of the broad ligaments, and again it is highly probable that such abscesses are inadvertently opened by the curet. The majority follows labor and abortion; a few are of gonorrheal origin. The greatest number of these abscesses lie in the anterior wall of the uterus.

The treatment is preëminently conservative throughout the acute stage. Rest in bed, ice applied to the abdomen, and sedatives for relief from pain when required, will carry the patient on to the subacute or chronic stage, when drainage should be established. Inasmuch as the abscesses are commonly located in the anterior wall of the uterus the usual procedure is to drain through a suprapubic incision. In exceptional cases vaginal drainage through the cul-de-sac will suffice.

TREATMENT OF INFLAMMATIONS OF THE UTERUS

In the discussion of the treatment of inflammations of the uterus the subject will be divided into the acute and chronic stages.

Acute Metritis.—The most important consideration is the prevention of acute infections of the uterus.

Prophylaxis.—Many of the causes of acute metritis are preventable, at least to a large degree. For a discussion of these causes see page 390. Two etiological factors stand foremost in point of frequency and gravity, *i. e.*, puerperal infection following labor and abortion, and gonorrhea. Only an outline will be given of the means employed in preventing these forms of infection. For further discussion see standard works on obstetrics.

Prevention of Puerperal Infection.—1. Avoid all unnecessary hastening of the second stage of labor.

2. Limit to a minimum the extent of puerperal wounds.

3. Repair all lacerated wounds of the perineum at the completion of labor.

4. Limit to a minimum the number of vaginal examinations.

5. Practice scrupulous asepsis before, during, and after labor.

6. Avoid prophylactic douches, unless especially indicated and directed.

7. Regard generative tract after labor as the *noli me tangere,* save in event of an emergency.

8. Completely remove all secundines from the uterus.

Prevention of Gonorrheal Infection.—1. Educate the profession and laity to a keen appreciation of the serious consequences of the disease.

2. Withhold sanction to marry or to resume sexual relations until, by repeated bacteriological examinations, the gonococci are known to be absent.

3. Avoid instrumental and digital manipulations within the urethra and uterine canal throughout the acute stage.

4. Use clean hands and instruments in all examinations.

5. To depend upon medical regulation and supervision of prostitution is inadvisable, inadequate, and promotive of a false sense of security from infection.

There are many predisposing factors to acute metritis which deserve consideration, such as constipation, tight-lacing, faulty elimination, excessive venery, uterine displacements, and constitutional diseases. These should be eliminated; the remedies are readily suggested.

Conservative Treatment.—The management of acute metritis must be preëminently conservative. Radical measures have been responsible for much harm. It may be said, without qualification, that there is but one indication for surgical interference in the acute stage of metritis, and that is the presence of placental tissue retained within the uterus. Under all other conditions no operative measures should be entertained.

Untimely surgical interference is responsible for the spread of infection. An endocervicitis is spread to the body of the uterus and an endometritis is made to involve the appendages. Every possible precaution should be taken to avoid disturbing the infection. Hence rest is of prime importance.

Rest.—Throughout the acute stage of the infection the patient should be confined to her bed. Instrumental and digital examinations should be made only when imperative.

Cleanliness.—Cleanliness should be maintained by means of the vaginal douche. When the discharge has a foul odor, formalin douches, in the proportion of 1 to 2000, will be found effective. Throughout the acute stage the douches should be given under low pressure, with the patient in the recumbent position. The temperature of the douche should be 110°, and the duration about ten to fifteen minutes.

Depletion of the Congested Tissues.—Long-continued hot vaginal douches, together with glycerin and ichthyol tampons, will deplete the congested tissues and shorten the acute stage of the inflammation. For a full discussion of the application of vaginal douches see page 196, and of tampons see page 213.

No intra-uterine applications are to be made in the acute stage, hence intra-uterine irrigations, injections, swabs, and packs are proscribed. The sole exception to this rule is that, subsequent to the removal of retained placental tissue, the uterine cavity should be irrigated with sterile normal salt solution.

Relief from Pain.—For relief from pain, cold applications may be placed to the hypogastrium. Here the ice-bag not only relieves pain, but is a valuable aid in reducing the inflammatory reaction.

The bowels should be kept freely open by the use of saline laxatives.

The diet should be light and nutritious.

The fluidextract of ergot in 10-minim doses or ergotol in 5- to 10-minim doses should be given three or four times a day in the puerperal cases, for the purpose of contracting the uterus and limiting the lymph and blood avenues for the conveyance of infection.

Stimulation.—Stimulation is required when there is depression from toxic absorption. For this purpose whisky or brandy may be given

freely; strychnine may be given in doses of $\frac{1}{20}$ to $\frac{1}{60}$ grain two to six times a day, and normal salt solution may be given by the bowel or under the skin to the extent of a pint one to four times a day. (See chapter on Hydrotherapy.)

The Surgical Treatment of Puerperal Infections.—If we are to intelligently apply operative measures in puerperal infections, we must know the nature of the infecting microörganisms, and also the limit to which the infection has extended. More than this, we should be possessed of means of determining the ultimate outcome of a given case, with or without surgical intervention, if we are to intelligently choose between tentative treatment and operative interference. We cannot as yet rely upon our clinical and laboratory guides in determining these factors. According to Sachs the prognosis is dependent upon three factors, *i. e.*, the resistance of the individual, the location of the infection, and the character of the infecting microorganism.

Removal of Retained Placenta.—Placental rests should be removed with the least possible injury to the uterus, and at the earliest possible moment, for the reason that placental remains may harbor saprophytes which in time may become virulent. This is best done with the fingers, and if this is impossible the Emmet curet forceps or placental forceps should be used, but the curet should never be used. Retained membranes can be safely left to nature.

Curettage.—Curettage of the infected uterus is universally condemned. It is generally conceded that a thorough curettage of the puerperal uterus is a difficult and dangerous task. "The curet is blind," and is capable of much mischief in the hands of the skilled as well as the novice. In the presence of virulent streptococci the danger is greatest because the inevitable wounds created by the curet will almost certainly be infected, and then follows an extension of the infection to the uterine musculature, pelvic connective tissue, appendages, peritoneum, and the general circulation of the blood.

Hysterectomy.—Inasmuch as there are no certain means of determining the extent of an infection, it is impossible to judge with certainty whether a hysterectomy will fully eradicate the infection. It is not known with certainty what the ultimate outcome of a uterine infection will be. Clinical signs and laboratory guides fail in this regard, and one is therefore at a loss to recognize the indication for hysterectomy in a puerperal infection. The infected uterus should be removed when it has been perforated or torn, when sloughing fibroids are inaccessible to myomectomy, when multiple abscesses of the uterine wall are recognized, and when the infected placenta cannot be removed through the natural channel. In these cases hysterectomy may be permissible, provided the infection has not become general and the strength of the patient will permit. To anticipate a generalized infection by extirpating the uterus when the above conditions do not prevail is not justified by present knowledge and experience.

Ligation of the Pelvic Veins in Puerperal Thrombophlebitis.—Frequency.—The frequency of puerperal thrombophlebitis is estimated at approximately 30 to 55 per cent. of all fatal cases of puerperal sepsis. The veins primarily involved are the uterine and ovarian or spermatic.

For years the aural surgeons were ligating the jugular vein to check the advance of infected thrombi, when W. A. Freund, in 1897, ligated the spermatic veins of two cases of puerperal thrombophlebitis, but without success. Five years later Trendelenburg operated on five cases, with one recovery. Since then Fromme, D. Cuff, Latzke, Whitridge Williams, Lenhartz, Opitz, Osterlow, Vineberg, Miller, Huggins, and others have reported cases.

Time of Operation.—We are admonished not to operate in the acute stage of the infection. Trendelenburg and Bucura say to operate after the fourth chill. It is questionable if this is a safe rule of practice, inasmuch as many cases are known to recover without operation after a dozen or more chills.

Contra-indications.—The operation is not advisable when metastatic abscesses are recognized, when pus has accumulated in the pelvis, and when there are distinct evidences of lymphatic invasion. Pneumonia and endocarditis are placed as contra-indications to the operation, while pleurisy and lung infarcts are not necessarily contra-indications.

Technic of Operation.—The thrombosed veins have been approached by three routes: the vaginal, the extraperitoneal, and the intraperitoneal. The first and second procedures have not been generally adopted for the reason that the veins of the pelvis and higher up in the abdomen cannot be under direct inspection.

The technic of the intraperitoneal route is briefly as follows: The abdomen is opened in the median line. The uterus and its appendages are inspected. Next the broad ligaments are inspected and palpated, with special reference to the course of the uterine and ovarian veins. If the broad ligaments are found to be thickened along the course of these veins the existence of thrombosis is assumed. The veins are then palpated along their course to a point above the thrombus; here the peritoneum is incised and a ligature is passed about the veins by means of an aneurysm needle. Ligature of the ovarian veins may be made as high as the vena cava on the right side and to the point of union with the renal veins on the left side. When the internal iliac vein is involved, it should be ligated near to its juncture with the external iliac vein. If a median iliac vein exists this should be ligated at its juncture with the external iliac trunk. Lea recommends the ligature of both sides in every case because of the free anastomosis. The more acute the infection the more extensive the ligations. Care must be taken to prevent ligature of the ureters and lumbosacral cord.

After such extensive ligations of the veins the pelvic organs and vulva become edematous, but this is soon remedied by the establishment of collateral circulation. When the thrombus has developed into an abscess it is advisable to dissect out the vein with a thermocautery.

My personal belief is that the Trendelenburg operation is a questionable procedure because of the difficulties encountered in the making of an accurate diagnosis and the many dangers attending the operation.

Chronic Metritis.—In the chronic stage of metritis the results of treatment are uncertain. This is particularly true of gonorrheal metritis.

Much may be accomplished in alleviating symptoms, but it is difficult to restore the diseased tissues to their normal state. There is apparently no disease of the uterus more difficult to cure than chronic metritis, because of the persistence of the infecting microörganisms, notably the gonococcus, and the tissue changes which are the result of infection.

There are many cases of "unsuspected metritis," and by this term is meant the presence of an inflammatory lesion in the uterus without physical or psychic functional disturbances. Menge divides these cases of unsuspected metritis into two classes: (1) Those in which the psychical condition is predominant, and (2) those in which the psychical condition is normal.

Neither of these two classes demands local treatment. To instigate local treatments could only serve to centre the attention of the patient upon the genital organs and give rise to grave psychic disturbances. The treatment in such cases is purely hygienic and psychic.

Chronic metritis is usually associated with psychic disorders, notably hysteria and neurasthenia. Psychic disorders demand psychic treatment; hence it follows that psychotherapy is an essential part of the rational treatment of such cases.

General Treatment.—The diet should be nutritious but light. The bowels should be carefully regulated. Systematic daily outdoor exercises are of the highest value. These regulations, together with psychotherapy, should be adopted whether local treatments are or are not employed.

For the control of hemorrhage due to endometritis general medication may suffice, but more often the remedies must be supported by local measures. These remedies are ergot, stypticin, hydrastis, styptol, and adrenalin. Rest must be enjoined along with the administration of these drugs.

Local Treatment.—Whenever local disturbances arise as the result of chronic metritis, local treatment is indicated.

Curettage.—In former years the curet was universally adopted as a means of treatment of chronic metritis. It is certain that its general use has led to much abuse in the hands of the general practitioner and specialist.

Olshausen says "that abrasio mucosæ is not every man's task." The truth of this statement is verified by repeated observations in which the curet has perforated the uterus, removed the mucosa to an extent that leads to partial or complete atresia of the cervical canal and cavity of the uterus, and again has failed to remove all of the diseased endometrium. The curet should never be used in the presence of a purulent leucorrhea. Indeed, the only indication for the use of

the curet in chronic metritis is to control hemorrhage. As indicated above, the curet has no place in the treatment of acute metritis.

When, therefore, we compare the indiscriminate use of the curet by the profession with the limited restrictions as above recorded we are impressed with the importance of giving serious consideration to the subject.

The indications, contra-indications, dangers, and technic of curettage are given in Chapter VII.

In event of perforation of the uterus by the curet no attempt to repair the injury should be made unless there is infection within the uterine cavity. If infection is present the author is of the opinion that the safest procedure would be to remove the uterus and establish drainage.

The patient should rest in bed one week after curettage. Hot vaginal douches, glycerin and ichthyol tampons, careful regulation of the diet, of the bowels, and of exercise should be directed for a variable period thereafter, if good and permanent results are to be obtained.

Medicinal Local Treatment.—Medicinal applications are made directly to the endometrium and indirectly to the uterus by means of vaginal packs, douches, and suppositories.

Douches.—Antiseptic douches have no more effect upon an infected uterus than does sterile water of like amount and temperature. The effect is detergent and thermic rather than antiseptic, for the reason that the antiseptic solution does not reach the infected tissues. Astringent douches are likewise deceptive in their action, inasmuch as only superficial tissues can be affected by the astringent properties of the douche.

Caustic Applications.—Caustic applications to the endometrium are applied for the purpose of destroying the diseased endometrium. Some are inert, some injurious, and only one, in the author's judgment, is preëminently satisfactory. Tincture of iodine is inefficient, and the same may be said of the sesquichloride of iron; nitrate of silver is liable to cause stenosis; the sulphate of copper produces uterine colic and has not afforded satisfactory results. Formalin in full strength is an excellent antiseptic application. It penetrates deeply, but is not known to cause stenosis. Formalin is applied by means of a swab. Intra-uterine injections are not advised for fear of injecting the solution through the Fallopian tubes, and because of the consequent danger of poisoning.

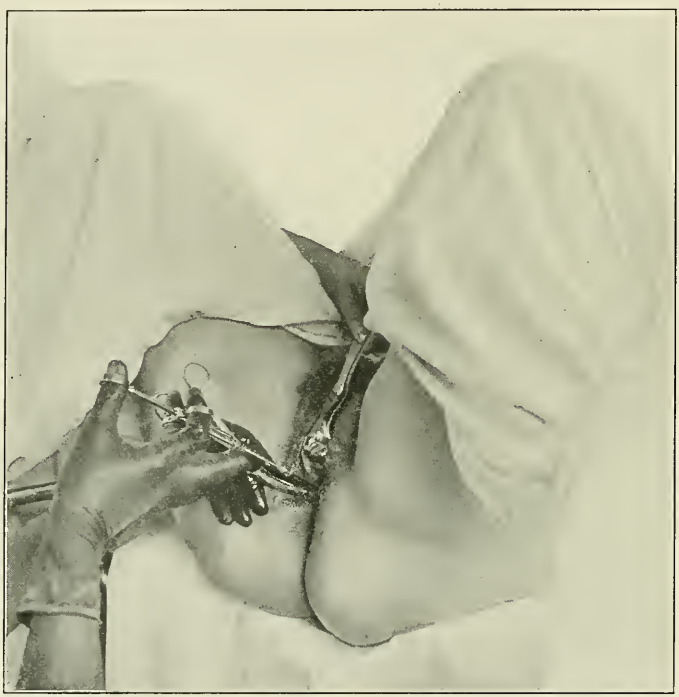
Technic of Swabbing.—In swabbing the uterus it is essential that the cervix be well dilated to allow the application to all parts of the endometrium. The cervix should be exposed, preferably by a hanging speculum overriding the perineum, and a narrow blade retractor for the anterior wall of the vagina. The anterior lip of the cervix is grasped by a single prong tenaculum forceps, by which gentle but firm traction is made upon the cervix.

The swab is passed through the dilated cervix, but not without knowledge of the size and position of the uterus previously gained

through a bimanual examination. This precaution is taken to prevent the possible puncture of the uterus.

The author generally uses wooden applicators accurately wound with cotton. They are recommended because they can be sterilized, together with the towels, sheets, and gauze, and their cheapness permits of using them but once. A thin film of cotton should be wrapped about the end of the applicator for a distance of at least four inches, in order that the cotton may not be lost in the uterine cavity. The objection to the wooden applicator is that it cannot be bent to conform to the

FIG. 313



Intra-uterine injection of zinc chloride. Cervix exposed by a retractor held by an assistant. Cervix grasped by a tenaculum forceps. Zinc chloride injected through a tonsillar syringe equipped with an extended metallic nozzle.

curve of the uterine canal. Three applicators are commonly used: one dry for the purpose of removing the mucus within the cervix and two for the application of formalin. A pledget of cotton or strip of gauze should be placed behind the cervix before applying the formalin, to protect the vaginal wall.

To give time for the formation of a slough, for the discharge of the slough, and for the regeneration of the mucosa, these applications should not be repeated at short intervals. Menge advises a second application in five to eight days if improvement in the symp-

toms does not follow. As a rule, but a single application is required for postpartum and postabortive infections, but in gonorrheal infection several applications may be required.

Only in the chronic stages of inflammation is this treatment indicated. Menge places the time limit at not less than three months after the initial infection.

Zinc chloride solution is an excellent escharotic, and should replace the curet in gonorrheal endometritis. It will as effectively destroy the diseased endometrium as the curet, and does not create wounds by which the infection can spread.

The technic of applying zinc chloride to the endometrium is as follows: If the patient is under an anesthetic the cervix is dilated and a 30 per cent. solution of zinc chloride is applied to the endometrium on a swab. A second swab should be used, to make sure that the work is done thoroughly. If no anesthetic is used, the author generally injects into the cavity of the uterus a 5 per cent. solution by means of a small syringe with a long curved metallic nozzle. These applications may be repeated from three to six times in the course of the following six to ten weeks. Caution must be exercised for fear of creating too deep a destruction of the tissues.

Operative Treatment.—*Amputation of the Cervix.*—Martin, of Griefswald, recommends the amputation of one or both lips of the cervix in extreme cases of chronic metritis. When preceded by curettage, amputation of the cervix often improves the condition of the uterus.

Subtotal Hysterectomy.—In women who have not yet reached the climacterium, an effort should be made to save a part of the body of the uterus so as to preserve the menstrual function. For this purpose the subtotal hysterectomy devised by Bruettner is advised. Following is the technic of the operation:

Step 1.—Median abdominal incision or the transverse incision of Pfannenstiel.

Step 2.—Careful inspection of the pelvic organs, with special reference to the ovaries. If part or all of the ovaries can be safely preserved, a cuneiform piece is excised from the fundus, avoiding, if possible, the insertion of the round ligaments. This incision is prolonged on either side into the broad ligaments (Fig. 314).

Step 3.—The wedge-shape portion of the fundus is grasped by tenaculum forceps and removed with scissors. The uterine arteries are ligated on either side (Fig. 315).

Step 4.—The uterine wound is closed by two or three rows of catgut sutures. The broad ligaments are carefully stitched with a continuous catgut suture. This leaves a small uterus, with little or no disturbance of the anatomical relations (Fig. 316).

Hysterectomy.—Hysterectomy is indicated in extreme cases of chronic metritis when general and local conservative measures fail to relieve distressing symptoms. When the appendages are removed such a uterus should be removed with them. In tuberculous metritis, not only the uterus but its appendages should be removed by way of the abdomen.

Treatment of Endocervicitis.—The mucosa lining the cervical canal may be infected independently of the body of the uterus. This is notably true of gonorrheal infections.

In the treatment of endocervicitis, swabbing with caustics and antiseptics have long been practised and are often of great value. This may be accomplished without anesthesia if the cervical canal is patent to the ordinary swab; if not, an anesthetic may be required to dilate the cervix.

Fig. 314

Outlines of cuneiform incision in the fundus.

Fig. 315

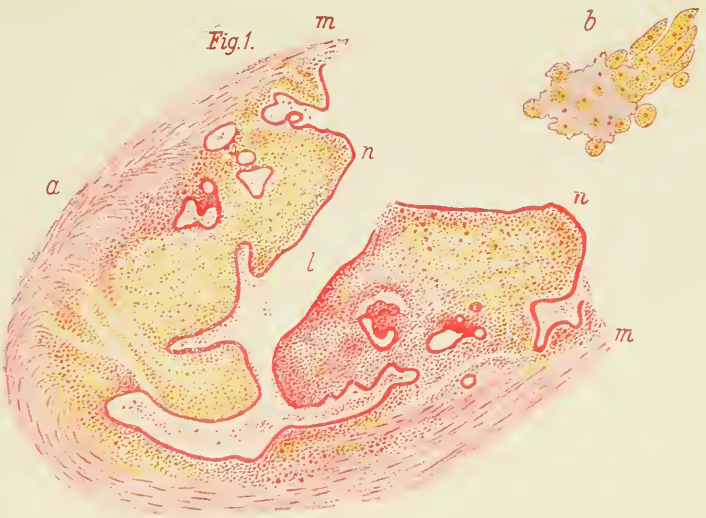
Wedge-shaped portion removed from the fundus.

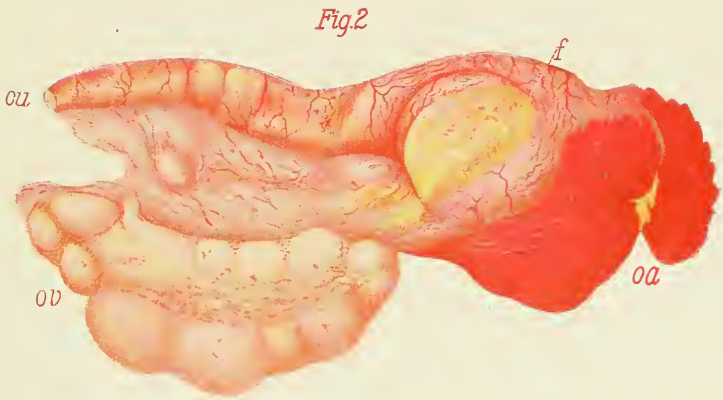
Fig. 316

Line of suture approximating the surface of the wedge removed from the fundus.

The following solutions are applied to the cervical endometrium by means of swabs: nitrate of silver, 25 per cent.; protargol, 5 per cent.; argyrol, 40 per cent.; formalin, full strength; zinc chloride, 5 per cent. In making these applications the cervix is exposed through a bivalve speculum and a pledget of cotton is placed back of the cervix to protect the vaginal walls. A satisfactory method of treatment is to inject

PLATE XXII





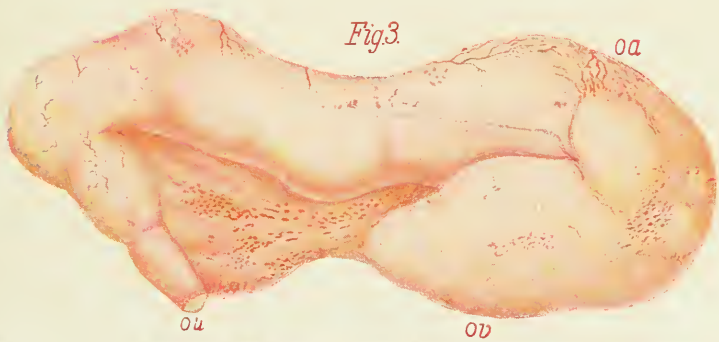


Figure 1[1]. *a.* Salpingitis Catarrhalis Hemorrhagica, Cross-section. *m.* Muscle of the tube. *n.* Mucosa of the tube. *l.* Lumen of the tube. Picrocarmine stain. (Hartnack, Oc. 2; Objective 4.) *b.* Leucocytes containing blood pigment with normal red blood-corpuscles from the tubal mucosa. (Harnack, Oc. 2; Objective 7.)

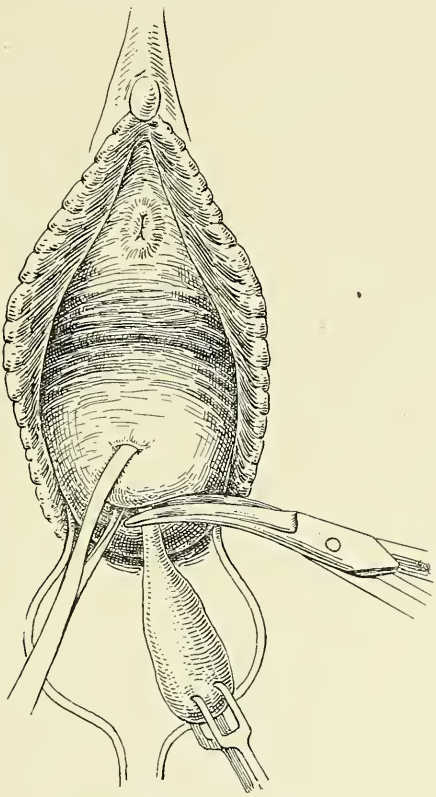
Figure 2. Salpingitis Purulenta Acuta Dextra. *ou.* Uterine opening of tube. *oa.* Abdominal end of tube. *ov.* Right ovary. *f.* Purulofibrinous deposit. Posterior view, natural size.

Figure 3. Salpingitis Purulenta Chronica Dextra. *ou.* Uterine end of tube. *oa.* Region of abdominal end of tube. *ov.* Ovary with strongly adherent tube. Posterior view, natural size.

[1] August Martin, Krankheilen der Eileiter.

a 5 per cent. solution of zinc chloride into the cervical canal by means of a small syringe, using a long curved nozzle. (See Fig. 603.) Care must be taken not to overdo this treatment for fear of creating stenosis of the cervix. The author does not advise the use of the solution oftener than once in ten days, and not more than three or four times. Vaginal douches of bichloride, 1 to 2000, or formalin, 1 to 2000 to 1 to 4000, should be given twice daily.

Fig. 317



Excision of a cervical polyp.

Craig advises the dilatation of the cervical canal followed by curettage of the cervical mucosa. This process may have to be repeated several times at intervals of two weeks. Following each curettage the author recommends the application of formalin in full strength.

In cases which resist all treatment the cervix should be amputated. (See Amputation of Cervix.)

All polyps of the cervix demand removal, and there should always be a microscopic examination of the excised tissues in view of finding a possible malignant growth.

Treatment of Erosions of the Cervix.—In the management of erosions of the cervix it should be borne in mind that by the removal of the cause, which in the majority of cases is resident in the uterus, the lesion will ordinarily heal spontaneously. That is to say, if the leucorrheal discharge ceases, the erosions will usually heal without direct interference.

The treatments commonly given in the office for the cure of erosions are often more harmful than beneficial; they are directed to a condition which is of secondary importance as compared with endometritis and other lesions resident in the uterus and adnexæ which give rise to the discharges, and thereby to the erosion.

Untold harm is done the patient by calling her attention to the existence of the lesion and by magnifying its clinical import. It is ill advised to even hint to these patients that the erosion may develop into a cancer.

Simple erosions demand no further treatment than the removal of the cause of the leucorrheal discharges, for with the removal of the discharges, spontaneous healing will follow.

Distended follicles (cysts of Nabothii) should be opened with a knife and the cavity swabbed with pure carbolic acid.

When the erosion resists treatment, as outlined above, the eroded area should be painted with pure carbolic acid once or twice a week, and following this the surface should be painted with tincture of iodine. This will effectually destroy the surface epithelium and allow the healing of the erosion by squamous epithelium. Several weeks may be required in the process. The applications should not be made oftener than once a week.

Papillary and follicular erosions demand more serious consideration, and particularly so if the tissues of the cervix are deeply infected and if deep lacerations exist.

When the vaginal portion of the cervix has undergone changes that are permanent, nothing short of excision of the affected tissues will afford relief. Schroeder's wedge-shaped amputation of the cervix is the operation of choice in these cases. It should always be preceded by curettage and the swabbing of the uterus with pure formalin, unless a purulent discharge exists, when the curet should be substituted by the application of formalin or zinc chloride to the infected endometrium. (For the technic of Schroeder's operation see Amputation of Cervix.)

It should be remembered that above these erosions is usually found a congested and infected uterus, if not a more extended involvement of structures lying beyond the uterus. It is therefore imperative to carry on a course of depleting treatment for a variable time after the healing of the erosion. (See Chronic Metritis, page 438.)

By depleting treatment, reference is made particularly to long-continued hot douches and glycerin and ichthyol tampons. The douches are given twice daily and the tampons three times a week until all evidence of pelvic congestion is relieved. During this course of treatment sexual intercourse and all strenuous exercises are interdicted.

CHAPTER XX

CIRCULATORY DISTURBANCES, INFLAMMATIONS, AND INFECTIOUS GRANULOMATA OF FALLOPIAN TUBES AND OVARIES

Circulatory Disturbances in the Fallopian Tube
- Causes
- Anatomical Diagnosis
- Clinical Diagnosis

Inflammations and Infectious Granulomata of the Fallopian Tube
- General Considerations
- Classification of Salpingitis
  - Catarrhal
  - Purulent
  - Tuberculous
- Syphilis of the Fallopian Tube
- Actinomycosis of the Fallopian Tube
- Parasites of the Fallopian Tube
- Treatment of Inflammatory Diseases of the Tubes
  - Non-operative Treatment
  - Conservative Operations
  - Radical Surgical Treatment
  - Operative Treatment

Circulatory Disturbances in the Ovary
- Etiology
- Anatomical Diagnosis
- Clinical Diagnosis

Inflammation of the Ovary (Oöphoritis, Ovaritis)
- Acute Ovaritis
- Chronic Ovaritis
- Cystic Degeneration of the Ovaries
- Abscess of the ovary

CIRCULATORY DISTURBANCES IN THE FALLOPIAN TUBES

Causes.—Whatever interferes with the general or local circulation in the pelvis may cause congestion of the Fallopian tubes. Thus diseases of the heart, lungs, liver, and kidney; abdominal tumors, ascites, chronic constipation, and tight-lacing are among the causes of tubal congestion.

Infectious diseases, dyscrasiæ of the blood, burns, toxemias, and menstrual congestion are additional general causes. A displaced tube, one that is twisted, constricted, or compressed, may cause congestion and possibly hemorrhages into the lumen of the tube.

Anatomical Diagnosis.—A congested tube is slightly swollen, dark red in color, and offers unusual resistance to pressure. Hemorrhages may be seen in the mucosa and in the lumen. Necrosis of the tube may result from interference with the blood supply. Martin describes a case of necrosis of the tubes as a result of mitral insufficiency.

When the ends of the tubes are closed and blood is extravasated into the lumen in sufficient quantity the tube will be distended into what is known as a hematosalpinx. For further description of hematosalpinx see page 458.

The microscope shows the vessels to be deeply engorged with blood extravasated into the tube wall and lumen.

Clinical Diagnosis.—A large proportion of cases may not be recognized, partly because of the frequency with which the lesion exists in the absence of all clinical manifestations and partly because of associated lesions. The menstrual periods may be painful, and the functions of the bowel and bladder are performed with more or less discomfort. Tenderness on pressure over the affected tube is the one constant sign. The diagnosis cannot be made with certainty without an exploratory incision. The existence of a possible cause, together with the finding of a tube that is somewhat tender to pressure and slightly enlarged, will lead to a probable diagnosis. It is impossible to differentiate clinically a congested tube from a catarrhal salpingitis; the former is the forerunner and accompaniment of the latter.

Diagnosis.—The diagnosis of hematosalpinx will be referred to on page 450.

Treatment.—See page 467.

INFLAMMATIONS AND INFECTIOUS GRANULOMATA OF THE FALLOPIAN TUBES

General Considerations.—Of all lesions of the Fallopian tubes the inflammatory are most commonly observed. Of the various exciting causes of salpingitis, Noeggerath and Wertheim place the gonococcus at the head of the list of microörganisms. In 302 cases of inflammatory lesions in the tubes there were 83 in which living microörganisms were found, and of this number 56 were gonococci, 11 streptococci, 6 staphylococci, 1 pneumococcus, while 122 were sterile. The fact that such a large percentage were sterile adds to the difficulty in determining the essential microbic cause. Neisser, in 143 cases, found the gonococcus in 80 after a latent period of from two months to eight years. He emphasizes the necessity of repeated examinations and faultless technic. Mixed infections are of common occurrence.

The path of invasion is usually by way of the uterus, less frequently by the abdominal route from the ovary, bowel, and peritoneum, and rarely by way of the lymph- and blood-streams.

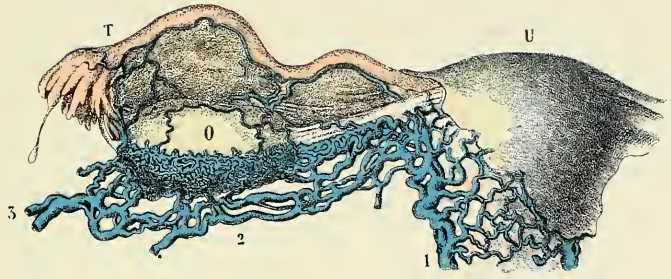
The manipulation of an infected uterus, in the process of an examination or operation, is doubtless often responsible for extension of the infection from the uterus to the tubes.

There are no pathognomonic symptoms of salpingitis and none that is invariably present. Associated inflammatory lesions in the genital tract are nearly always found, and hence it is that the symptoms of the one are so intimately associated with those of the other; therefore it is difficult to obtain a clinical picture of salpingitis.

Again, the innervation of the tubes, ovaries, and uterus is so intimately connected as to bring these organs into close sympathy one with the other.

PLATE XXIII

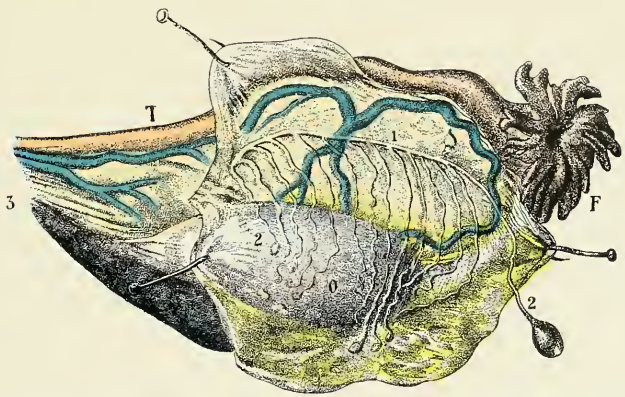
Fig. 1



Bulb of the Ovary and its Venous Communications. (Savage.)

O, ovary; *T*, Fallopian tube; *U*, uterus; 1, uterine vein and plexus; 2, subovarian venus plexus; 3, commencement of ovarian vein.

Fig. 2



Mesosalpinx Laid Open, showing the Parovarium or Organ of Rösenmüller. (Savage.)

T, Fallopian tube; *F*, fimbriated extremity of same; *O*, ovary; 1 remnant of Wolffian duct; 2, 2, remnants of the cecal tubes of the Wolffian bodies; 3, ovarian ligament.

Pain is the most constant symptom, and yet advanced cases of salpingitis exist in the absence of pain. Temperature has but little diagnostic value. Sterility does not necessarily follow as the result of double salpingitis, though it is the rule. An occluded lumen may eventually become patent and permit the passage of the ovum.

The history of infection and the clinical course of the disease cannot, in themselves, suffice for a diagnosis, but must be supported by direct palpation of the diseased tubes.

CLASSIFICATION OF SALPINGITIS

I. Catarrhal Salpingitis.
  1. Acute catarrhal salpingitis (endosalpingitis).
  2. Chronic catarrhal salpingitis.
    a. Salpingitis isthmica nodosa.
  End-stages:
    a. Hydrosalpinx.
    b. Hematosalpinx.

II. Purulent Salpingitis.
  1. Acute suppurative salpingitis.
    a. Septic.
      1. Puerperal.
      2. Non-puerperal.
    b. Gonorrheal.
  2. Chronic suppurative salpingitis.
  End-stage: Pyosalpinx.

III. Tuberculous Salpingitis.

I. **Catarrhal Salpingitis.—Etiology.**—The statistics of Martin illustrate the frequency of the lesion. In 1402 operations on the tubes 415 (29.5 per cent.) were for catarrhal salpingitis.

As a rule, the lesion is secondary to inflammatory diseases of the uterus, which extend by direct continuity of tissue. Primary catarrhal salpingitis, in the absence of an inflammatory lesion elsewhere in the pelvis, is an unusual occurrence.

The causes of catarrhal salpingitis are thermic, mechanical, chemical, and microbic.

1. *Thermic influences* resulting in salpingitis can scarcely act directly because of the deep-seated location of the tube. Menstrual congestion from chilling of the body may be placed in this category.

2. *Mechanical causes* have a greater significance. Such, for example, are digital and instrumental manipulations, sexual excesses, massage, and overstrain in lifting and walking.

3. *Chemical irritants* in the form of antiseptics injected into the uterus may pass into the tubes and set up a salpingitis.

4. *Pathogenic microörganisms* are by far the most essential and prevailing factors in the causation of catarrhal salpingitis.

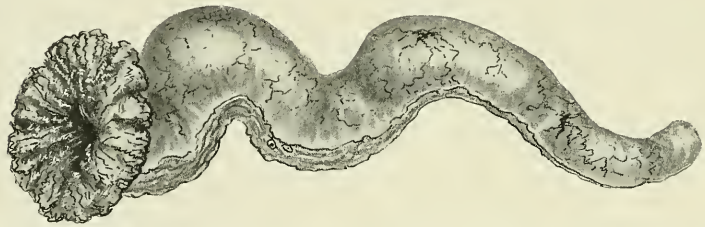
It is not always possible to distinguish between the above-named

causes in a given case of catarrhal salpingitis. Two or more factors may operate to bring about the same result. Of the general diseases complicated by catarrhal salpingitis, mention may be made of the infectious and contagious diseases, notably tuberculosis, and malaria.

Anatomical Diagnosis.—In *acute catarrhal salpingitis* the tube is of a livid or dark red color, slightly thickened and convoluted. Its consistency is increased to a limited degree, and the fimbriæ are red, swollen, and retracted to a variable degree preparatory to a possible closure of the abdominal end of the tube. On cross-section of the tube the mucosa rolls out and is congested and thickened. In the lumen of the tube is a variable amount of serous fluid. No adhesions surround the tube.

The microscopic diagnosis is based upon marked congestion and infiltration with small round cells in the mucosa and to a less degree in the musculature. Here and there are hemorrhagic extravasations into the connective-tissue spaces. The epithelial lining of the tube lumen may be normal, but in long-standing lesions the cells may

FIG. 318



Chronic catarrhal salpingitis. The tube is about double the normal size. Its course is irregular, and the serous covering is congested. The fimbriæ are swollen, but do not occlude the abdominal opening of the tube.

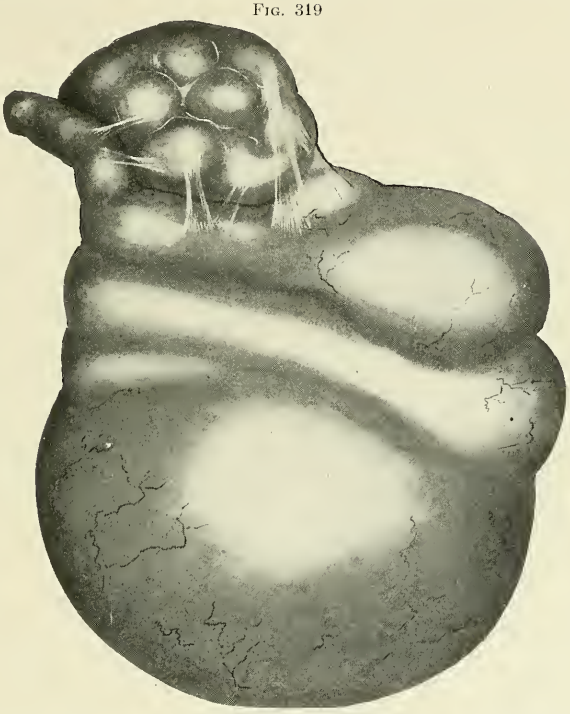
degenerate and become desquamated. The secretion found in the lumen of the tube is in great part lymph mixed with blood cells and degenerated epithelium. From the acute stage the tube may early resolve into a normal condition, suppuration may follow, or, as is not infrequently the case, the acute stage may pass into the chronic.

In *chronic catarrhal salpingitis* the tube is enlarged in all diameters and is correspondingly convoluted. The tube is of firmer consistency than in the acute stage. The mucosa and muscularis are thickened through congestion of the bloodvessels and hyperplasia of the connective tissue. The epithelium lining the tube lumen may be destroyed. Following this the lumen may be obliterated by adherence of the denuded mucous folds. Adjacent folds of mucous membrane may adhere by their free margins and lock in spaces which are filled with a serous secretion and lined with columnar epithelium, thereby closely simulating retention cysts formed from glands. The mucous folds become club-shaped from congestion and an inflammatory exudate. The peritoneal covering of the tube may be involved, and adhesions may surround the tube and

close up the fimbriated end, and this leads to the formation of a hydrosalpinx.

Salpingitis isthmica nodosa is regarded by Chiari and Schauta as a circumscribed interstitial salpingitis, located in the isthmus of the tube and forming a nodular enlargement, varying in size from that of a split pea to a bean. Gebhard regards these growths as benign adenomata.

FIG. 319



Hydrosalpinx. The tube is distended with serum into an irregular retort-shaped mass the size of a fetal head. The wall of the cyst is thin and transparent. The uterine end of the tube is not distended. A normal ovary lies adherent to the distended tube. (Specimen removed by Dr. J. Clarence Webster.)

Hydrosalpinx (sactosalpinx serosa) is the end stage of catarrhal salpingitis. The ends of the tube become closed and the pent-up secretion distends the tube into a serous sac. Because the thin, distended, fimbriated end of the tube offers little resistance to the accumulated fluid, the tube distends at the outer end to a far greater extent than at the uterine end, where the muscular wall is more resistant and the lumen of the tube smaller. It is unusual for the tube to distend throughout its entire length. It may enlarge to the size of a child's head. The larger the tube the thinner and more transparent is the wall.

Adhesions to the tube are not ordinarily present, and when present are seldom firm, hence hydrosalpinx is more or less movable. The fimbriated end is shaped like a club or retort. Radiating lines mark the adhesions of the fimbriæ.

In the early stage there is the gross and microscopic appearance of catarrhal salpingitis. As the tube distends the walls become thinner and more transparent; the mucosa thins and the musculature is stretched and atrophied, presenting longitudinal bands of muscle fibers running the entire length of the tube and terminating at the fimbriated end in a rosette figure.

The epithelium of the mucosa is compressed and may be wholly lost. The contents of the tube is a clear, serous fluid with a specific gravity of 1.005 to 1.010, and an alkaline or neutral reaction. Sometimes the fluid is of a greenish tint, due to the presence of cholesterin. Desquamated epithelium, leucocytes, and occasionally a few red blood cells are found in the fluid contents of the tube.

When the uterine end of the tube is not permanently and completely closed, the contents may be periodically discharged into the uterus (hydrops tubæ profluens). As expressed by Sutton, the blockade at the uterine end has been raised.

The contents of the tube may be absorbed, but it is unusual for the fimbriated end to reopen.

A pyosalpinx may develop from a hydrosalpinx by secondary infection with pyogenic organisms conveyed through the uterus or bowels. Torsion of a hydrosalpinx is a possible event leading to the formation of a hematosalpinx.

Sutton gives the following reasons for believing that a pyosalpinx often resolves into a hydrosalpinx:

1. Hydrosalpinx is not found in acute cases.
2. In many chronic cases hydrosalpinx is found on one side of the uterus and pyosalpinx on the other.
3. The ampulla of a tube will sometimes be dilated into a hydrosalpinx, while the isthmus contains pus.
4. The fluid contents in a hydrosalpinx will sometimes be colorless, but the recesses of the tube contain caseous material and cholestrin.
5. The dilated tube in the hydrosalpinx may, as in pyosalpinx, communicate with a large ovarian follicle to form a tubo-ovarian cyst.

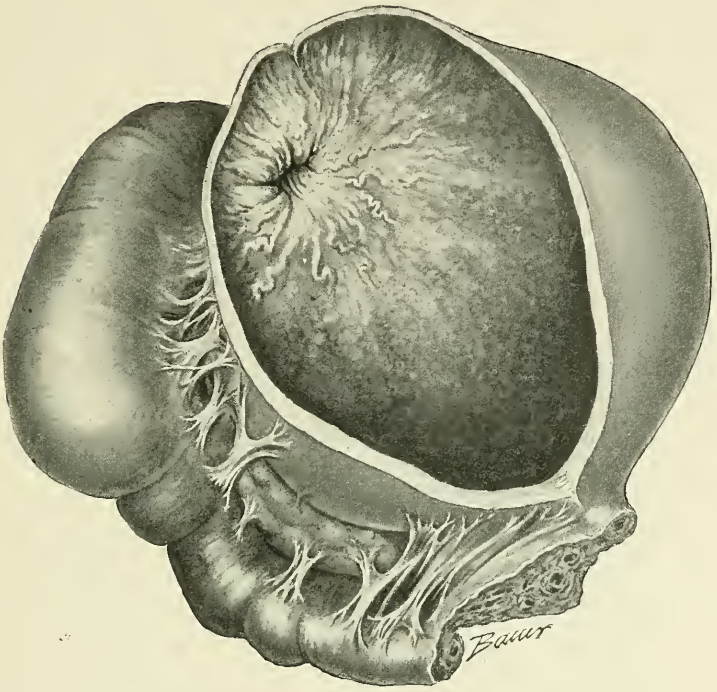
Tubo-ovarian Cyst.—Here the ovary is distended into a cyst which communicates with a hydrosalpinx through an adventitious opening. A congenital tuboövarian cyst has not as yet been described. As a rule, the hydrosalpinx and ovarian cyst develop independently. Later, the two structures unite by adhesions, the partition wall atrophies and gives way, and there is established a communication between the two. Rokitansky described a corpus luteum cyst communicating with a hydrosalpinx.

The fimbriæ of the tube may be found free in the ovarian cyst or adherent to the inner surface of the cyst wall.

Hematosalpinx.—From the macroscopic appearance it is not always possible to distinguish an inflammatory hematosalpinx from one due to ectopic pregnancy or to other non-inflammatory causes. The wall of the tube is possibly thicker from round-cell infiltration and hyperplasia, and inflammatory adhesions may form about the tube. In

addition there are usually found evidences of infection in the uterus. A study of specimens of hematosalpinx will, in a large percentage of cases, lead to the discovery of an embryo, an apoplectic ovum, or chorionic villi. It is the uniform testimony of observers that nearly all cases of hematosalpinx are due to ectopic gestation.

Fig. 320



Tuboövarian cyst.

The term hematosalpinx should be confined exclusively to Fallopian tubes dilated with blood and in which there is no evidence of pregnancy. A dilated tube containing chocolate-colored fluid is not to be classed as hematosalpinx.

The gross and microscopic appearances of hematosalpinx do not differ greatly from those of hydrosalpinx, with the exception of the contents and the dark red color which is imparted by the contents. Fluctuation may not be so distinct in hematosalpinx.

Clinical Diagnosis.—1. *Acute Catarrhal Salpingitis.*—The clinical picture is usually that of uterine catarrh or of acute pelvic inflammation. The tubes alone are seldom involved, hence it is difficult to clearly define the clinical signs of catarrhal salpingitis. There is a feeling of weight and discomfort in the pelvis, often amounting to acute pain, which is located in one or both sides. Painful urination and defecation are sometimes complained of.

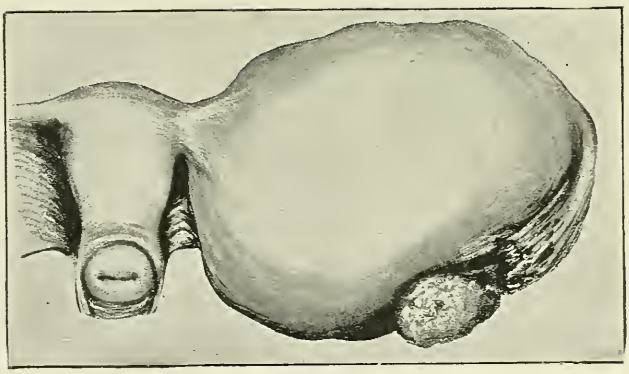
The initial chill, followed by a rise of temperature, which is accompanied by flashes of heat and cold, may be due to the salpingitis, but is more often the result of extensive lesions in other parts of the pelvis.

It is possible for catarrhal salpingitis to exist without the knowledge of the patient.

The diagnosis must, therefore, rest largely upon the local findings, for in the absence of a physical examination no positive diagnosis can be made. Because of pain and tenderness the tubes cannot be palpated without an anesthetic. The tube as outlined in a bimanual examination is about the size of the little finger; it is movable, slightly more resistant to pressure than the normal tube, and at the fimbriated end the sensation imparted is that of a soft, ill-defined mass.

2. *Chronic Catarrhal Salpingitis.*—Chronic catarrhal salpingitis may arise in an insidious manner, or may begin as an acute infection, with all the symptoms and signs above referred to. In the chronic stage there is no temperature and no increase in the pulse-rate. The patient is often nervous, and suffers from pain, particularly during the menstrual periods. Sexual intercourse is painful, and a leucorrheal discharge is a common accompaniment.

Fig. 321



Large hematosalpinx; semidiagrammatic. (Thomas and Mundé.)

In the form described by Chiari and Schauta, known as salpingitis isthmica nodosa, the pain during menstruation is colicky and cramping. The tenderness on palpation is not so great as in the acute stage. The tube is outlined as irregular, convoluted, and of the size of the thumb or index finger. In consistency the tube is much firmer than normal, and in manipulating the tube the range of motion is observed to be restricted, in part from loss of flexibility, and in part from the presence of adhesions about the tube. The position of the tubes is seldom normal. More often they are found at the side of or behind the uterus. The uterus may be drawn to the affected side and restricted in its range of motion.

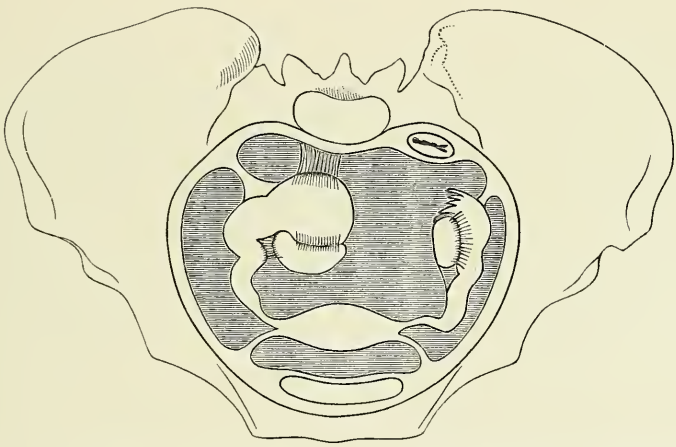
In salpingitis isthmica nodosa the nodular swellings near the horn of the uterus are sometimes recognized in a bimanual examination. Few cases have been diagnosticated clinically.

Hydrosalpinx and hematosalpinx are recognized clinically by the pressure they make upon the surrounding structures and by direct palpation. The patient may be wholly unaware of the existence of the lesion.

In a conjoined examination, preferably under anesthesia, the distended tube is outlined as a retort-shaped mass, tense, elastic, and often fluctuating. If no adhesions surround the tube there should be a free range of motion. The small and firm uterine end, together with the outer, rounded, elastic, and fluctuating portion, give the impression of an ovarian cyst. The ovary can rarely be recognized apart from the distended tube. There is no way of detecting a hydrosalpinx from a hematosalpinx except by aspirating or by an exploratory incision.

Tuboövarian cysts are only recognized after the cyst is removed.

Fig. 322



Right tuboövarian abscess and left pyosalpinx. The right tube and ovary are distended with pus, as is also the left tube. Adhesions bind the right tube and ovary together and the right tube to the posterior surface of the uterus, rectum, and wall of the pelvis.

II. **Purulent Salpingitis.**—**Etiology.**—The causes are essentially those of catarrhal salpingitis. As previously stated, catarrhal salpingitis may be followed by suppuration. On one side there may be a catarrhal salpingitis; on the other side a purulent salpingitis; the two apparently distinct and separate lesions may be dependent upon the same cause.

Following are the statistics from the clinic of A. Martin: In 2098 cases of purulent salpingitis, 279 were caused by gonorrhea, 374 by puerperal septic infection, 19 by tuberculosis, 13 by syphilis. Of this number 1282 were preceded by catarrhal salpingitis. From the statistics of Martin, Schauta, Frommel, Charrier, Wertheim, and Prochowick 376 cases are collected, and of this number 76 showed a pure culture

of the gonococcus, 10 a mixed gonococcus infection, 15 a staphylococcus and streptococcus, 7 a pneumococcus, and 3 a bacterium coli infection. In 15 there was doubtful identity and in 215 the tubes were sterile.

In puerperal septic infection the essential causes are, in the order of frequency, staphylococcus pyogenes aureus and albus, and streptococcus pyogenes. The gonococcus, the tubercle, and colon bacilli are occasional factors.

The infection commonly travels by direct continuity of tissue, passing directly from the endometrium to the tube. Occasionally the infection is conveyed through the broad ligaments to the tube, or from the peritoneum to the tube.

Infection of the tubes acquired by instrumental and digital manipulations is due to the same sort of bacteria found in puerperal infection.

Gonorrheal infection of the tube is for the most part acquired by sexual intercourse, but may be conveyed by instruments and fingers, both in the puerperal and non-puerperal state. The infection usually travels by continuity of tissue, but may be conveyed by the lymph- and blood-streams.

Anatomical Diagnosis.—1. *In acute purulent salpingitis* there are all the evidences of an intense acute inflammation. The tube is enlarged, possibly to the size of the thumb; the color is an intense red; the distended bloodvessels stand out prominently under the serous covering, and the fimbriæ are swollen and retracted. Early in the process the fimbriæ may be agglutinated, thereby completely closing the abdominal end of the tube. These adhesions are not firm, and for this reason the bimanual examination must be made cautiously for fear of expressing the pus from the tube into the abdominal cavity. From the naked-eye appearance of the unopened tube it is impossible to say whether or not there is pus within the lumen.

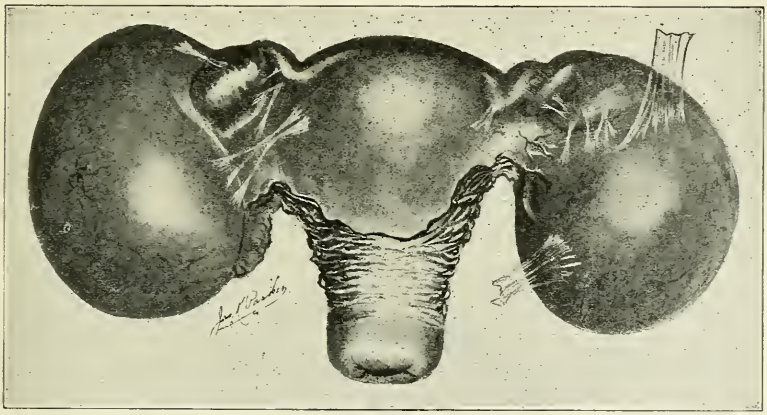
In the acute stage a fresh fibrinous exudate forms about the tube, and as the lesion passes into the chronic stage these adhesions extend and become more firmly organized. The elongation of the tube leads to kinking and convolutions in its course, and the tube may be completely doubled upon itself. In the lumen of the tube pus is accumulated in varying amounts.

Under the microscope the tubal wall is seen to be congested, and there is a round-cell and leucocytic invasion of its entire wall. Pyogenic microörganisms can be demonstrated throughout the wall. The epithelium of the mucosa is soon destroyed, and the folds of denuded mucous membrane adhere, thereby partially or completely obliterating the lumen of the tube and locking in spaces filled with pus. Throughout the muscularis and underneath the serous covering are localized areas of suppuration. In the pus accumulated in the lumen and wall of the tube it is often possible to demonstrate the presence of the microorganisms causing the infection. The older the infection the less likely is the finding of bacteria. There may be superficial necrosis of the mucosa forming a pseudodiphtheritic membrane. Gonorrheal infection is more likely to be confined to the mucous membrane than are the

other forms. Wertheim demonstrated the presence of the gonococcus in all portions of the tube.

2. *In chronic purulent salpingitis* the tube is about the size of the thumb. The color is not such an intense red as in the acute stage, and the adhesions are firmer and more extensive. The fimbriæ are almost invariably adherent, obliterating the abdominal end of the tube. The convolutions of the tube are bound one to another, and are adherent to the ovary, uterus, bowel, bladder, omentum, and abdominal wall. These adhesions permit very limited excursions of the tube. As the tube enlarges and the adhesions contract the tube and ovary adhere to the side or posterior surface of the uterus. The appendix vermiformis and tube are so frequently adherent that it is always advisable to inspect the appendix when the abdomen is opened. From the tube the pus may evacuate into an adherent hollow viscus (bladder, rectum). Again, the infection may travel from the bowel to an adherent tube and cause a secondary infection of the tube.

Fig. 323



Gonorrheal metritis, double pyosalpinx, and ovarian abscess. The uterus is uniformly enlarged and firm. The tubes are retort-shaped, and are matted to the distended ovary and sides of the uterus.

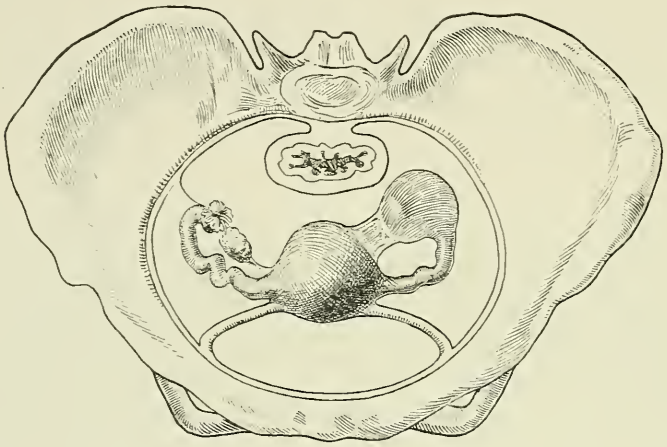
The pus within the tube is usually yellow or grayish yellow, rarely greenish or blood-stained. Nothing can be ascertained from the naked-eye appearance of the pus as to its virulence. In long-standing cases the formed elements of the pus may absorb, leaving a serous fluid.

The entire wall of the tube is thickened through congestion and hyperplasia of the connective tissue. Small abscesses may be seen in the mucosa, the muscularis, and underneath the serosa.

Pyosalpinx (*Sactosalpinx Purulenta*).—When the ends of the tubes are closed the pus accumulates within the lumen and distends the tube. The greater distention is at the fimbriated end, where the wall is thin. It is seldom that the tube is distended throughout its entire length.

The size is seldom greater than a man's fist, but it may be large enough to reach above the brim of the pelvis and even to the umbilicus. The wall of the tube is at first thickened, but when greatly enlarged there is an irregular thinning, almost to the point of rupture. Rupture of the tube may take place at its lower circumference between the layers of the broad ligament or at any point in the wall of the tube. Adhesions usually protect the peritoneal cavity, but occasionally direct the pus into a hollow viscus or into a cyst of the ovary. Left pyosalpinx is prone to rupture into the rectum.

FIG. 324



The left tube is distended with pus and is adherent to the posterior surface of the uterus. The right tube and ovary are normal.

The pus contained within the distended tube is found in various stages of preservation, and is mixed with red blood cells, degenerated epithelium, fibrin, and detritus. The mucosa atrophies from pressure, and may be replaced by connective tissue. The epithelium is almost wholly destroyed. The muscle and connective-tissue fibers are atrophied and the bloodvessels are limited in number.

Clinical Diagnosis.—1. *Acute purulent salpingitis* is generally ushered in by marked constitutional disturbances. There may be an initial chill; this is followed by a rise of temperature and pain referred to the affected tube. In nearly every instance there is a similar lesion in the uterus which may mask the more limited affection of the tube. Frequently the infection does not stop in the tubes but is carried on to the ovaries and peritoneum, giving rise to additional temperature and pain that will wholly mask the clinical manifestations of the affected tube. After complete resolution in the uterus and peritoneum, the infected tube may fail to resolve, and remain distended with pus. This indisposition on the part of the tubes to resolve as readily as do other parts of the genital tract is explained in part by the lessened

power of absorption in the tube, but in greater part by the closure of the ends of the tube, thereby, locking in the pus.

Repeated exacerbations are the rule. These are brought about by sexual excesses, menstrual congestion, and injudicious exercises.

We seldom find gonorrheal infection invading the tubes before the second or third week after the initial infection of the cervix. As a rule, the general symptoms are not so well-marked in gonorrheal infection as in other forms of septic infection.

2. *Chronic purulent salpingitis* usually begins with an acute attack and ends in a pyosalpinx. The general disturbances are in nowise proportionate to the extent of the lesion. All symptoms may be absent in the presence of an extensive lesion. Menstrual disorders in the form of menorrhagia and dysmenorrhea are fairly constant symptoms. Pain in the region of the tubes and referred to the back and thighs, together with digestive disorders, are common complaints. Sterility is almost sure to result from a bilateral involvement of the tubes. Martin reports three cases of bilateral pyogenic infection of the tubes in which pregnancy followed.

Palpation of the diseased tubes can usually be accomplished without difficulty. When found impossible to clearly outline the tubes, an anesthetic should be given. The uterus is first located; it is seldom found in the median line, and its range of mobility is restricted. The tubes are engaged between the examining fingers, and are traced outward from the horns of the uterus or downward and backward, beside or behind the uterus. They are felt as sensitive, thickened cords varying in consistency, size, position, and degree of mobility. The consistency is always firm at the uterine end but less so at the fimbriated end. The kinks in the tube are felt as nodules in its course. Sensitiveness to pressure is directly proportionate to the acuteness of the inflammation. The ovary can be palpated apart from the tube only in exceptional cases. The position of the tube largely depends upon the position of the uterus. In retroposition the tubes and ovaries usually lie in the pouch of Douglas. With the uterus erect and forward it is scarcely possible for the tubes to reach into the pouch of Douglas. There will be no fluctuation unless the tubes contain a considerable amount of pus.

The walls of a pyosalpinx are thicker and more resisting to the pressure of the contained fluid; hence the tube is rarely so large as a hydrosalpinx may become. Furthermore, fluctuation is less marked, and there is greater fixity and sensitiveness to pressure.

The character of a pyosalpinx should be determined when possible—that is, whether due to gonorrhea, puerperal infection, tuberculosis, or non-puerperal septic causes.

The clinical history will often lead to a positive diagnosis, particularly in gonorrheal and puerperal cases. Gonorrhea is assumed to be the cause when other possible factors are eliminated.

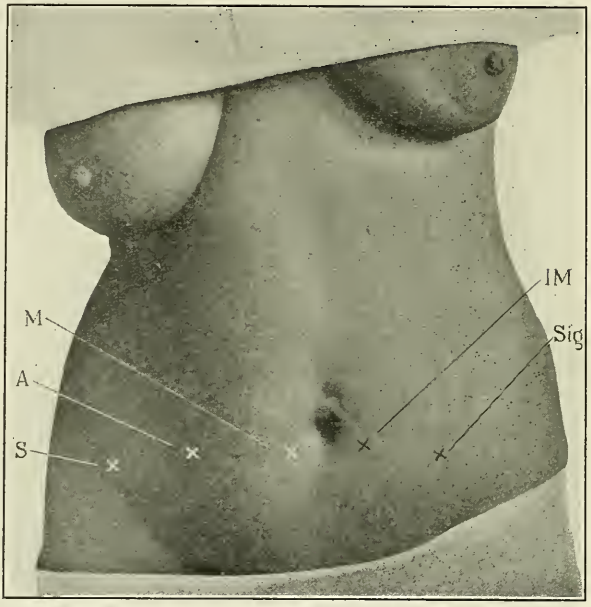
The presence of a purulent discharge from the urethra and infection of the glands of Bartholin will lead to the diagnosis of gonorrheal

salpingitis. Absolute certainty in the diagnosis is only obtained by the finding of the gonococcus of Neisser in the secretion.

Diagnosis of Sactosalpinx.—The term sactosalpinx is applied to a Fallopian tube distended with fluid, *i. e.*, blood, serum, or pus. Under the generic term sactosalpinx are placed hematosalpinx, hydrosalpinx, and pyosalpinx—the end-stages of catarrhal and purulent salpingitis. The following features are characteristic of sactosalpinx:

The *position* is at the side of or behind the uterus, extending from the horn of the uterus outward or downward. Unless greatly distended the tube lies below the normal level, most often close to the side of the uterus or immediately behind.

Fig. 325



Tenderness over the right and left Morris points suggests the presence of chronic pelvic inflammation Tenderness over the right Morris point and appendix suggests appendicitis. Tenderness over the appendix and both Morris points suggests chronic pelvic inflammation and appendicitis. *M*, right Morris point; *IM*, left Morris point; *A*, appendix; *Sig*, sigmoid; *S*, anterior superior spine.

The *consistency* is so variable as to render it of little value in diagnosis. When fluctuation is present it is of some diagnostic significance, but is so often absent that it cannot be relied upon.

The *general contour* is significant. We generally speak of sactosalpinx as being of retort- or sausage-shape. The tube is distorted in proportion to the degree of distention. The irregularity in the course of the tube can usually be noted in a bimanual examination. The tube may be so snugly twisted upon itself as to give to the examining finger the impression of a round or oval swelling. So firmly may the

tube adhere to the uterus that the two are felt as a single mass. The outline of the tube may be lost in a surrounding inflammatory exudate.

The Diagnosis of the Contents of a Sactosalpinx.—Following the recognition of a sactosalpinx it is next important to determine the contents of the distended tube. This can only be done with certainty by an exploratory puncture through the vagina or by an exploratory incision. The danger of carrying infection into the tube by the exploring needle is not to be disregarded. Fortunately the indications for such a procedure are limited, because whether blood, pus, or serum is present an operative procedure is indicated.

Differential Diagnosis of a Sactosalpinx.—Kelly gives the following differential diagnosis between gonorrheal and streptococcic infection of the tube:

Gonorrheal Infection	Streptococcic Infection
1. Slow in its onset, often preceded by inflammation of the external genitals and urethra.	1. Onset abrupt, following miscarriage, normal labor, or topical applications.
2. Pain localized in one or both ovarian regions.	2. Pain more general and severe in the lower abdomen.
3. No signs of general peritonitis.	3. Usually signs of peritonitis.
4. Suffers more or less constantly, but may have no fever.	4. Suffers constantly, and usually has a septic fever.
5. Temperature 98.5° to 102° F. (38.9° C.).	5. Temperature 101° to 105° F. (38.3° to 40.5° C.).
6. Pulse accelerated, but of good quality.	6. Pulse never feeble and is more rapid.
7. Attack lasts from five to fifteen days.	7. Attack seldom lasts less than a month, and may continue three months or more.
8. Often presents the appearance of good health.	8. Anemic and weak.
9. Gonococci usually found on cover-slip preparation from the cervical, urethral, or vulvovaginal glandular secretions.	9. Gonococci not found in the secretions.
10. History of marital gonorrhea.	10. Husband sound.

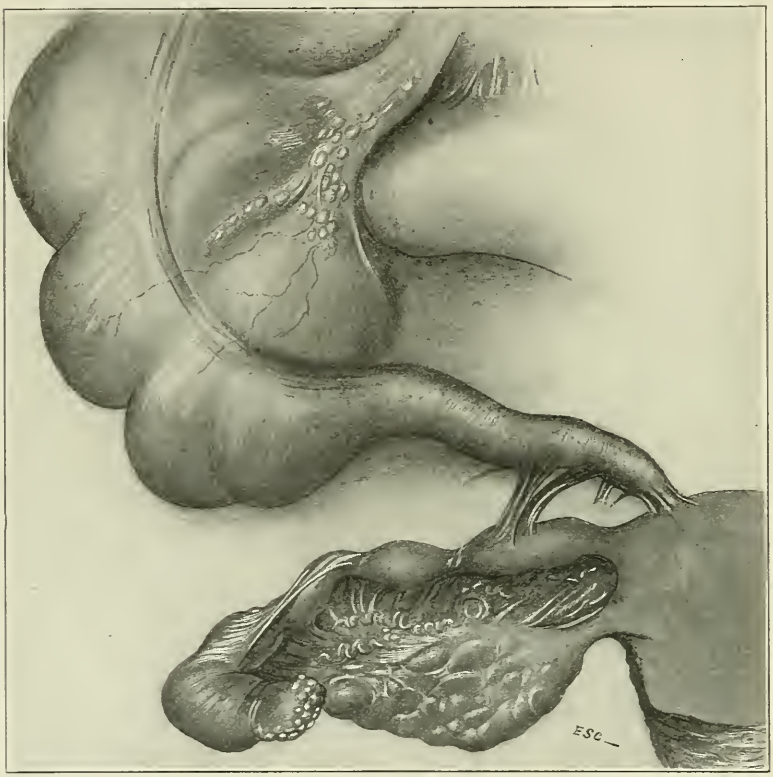
Appendicitis	Tuboövarian Disease
1. No previous local disturbances.	1. Genito-urinary functions previously disturbed. Usually a history of gonorrheal or puerperal infection.
2. Chill usually absent.	2. Chill may precede fever.
3. Pain in right iliac region, sudden onset, acute, and not radiating to thighs.	3. Gradual onset, pain dull, continuous, and radiating.
4. Fever of variable degree.	4. Fever often entirely absent.
5. Muscular rigidity on right side of the abdomen.	5. No muscular rigidity unless complicated by peritonitis.
6. Inflammatory exudate about appendix three to five days after onset of symptoms.	6. Inflammatory exudate in the pelvis felt by vaginal examination at the onset of the symptoms.
7. Vaginal examination is rarely painful in appendicitis.	7. Always painful in tuboövarian disease.

Krussen says the appendix is involved in 15 per cent. of cases of tuboövarian disease.

Martin found appendicitis complicating right-sided salpingitis 13 times in 276 cases. Ochsner, in 51 cases of appendicitis, found the tube and ovary involved 15 times. Because of the frequency with which appendicitis and salpingitis are associated, an inflammatory lesion in the right side of the pelvis should suggest a possible involvement of both of these structures, and no operation is complete on either of these structures without investigating the condition of the other. It is possible for a primary appendicitis to extend to the rectocecal connective tissue and on to the pelvic connective tissue, giving rise to a secondary parametritis. A similar extension may take place along

the peritoneum from the cecum to the tubes and ovaries. The history of the onset and the previous complaints are important considerations. Next in point of importance is the position of the swelling. Tumefactions in and about the tube are intimately connected with the uterus, and can be traced to its horn. In appendicitis the swelling is high up in the right iliac space, and in enlarging it extends downward into the

Fig. 326



Appendix adherent to fundus of uterus and right Fallopian tube. An acute attack of appendicitis followed pregnancy.

pelvis in contrast to the swellings of tuboövarian diseases, which extend upward from the pelvis. In appendicitis it may be possible to palpate the tube and ovary apart from the exudate about the appendix.

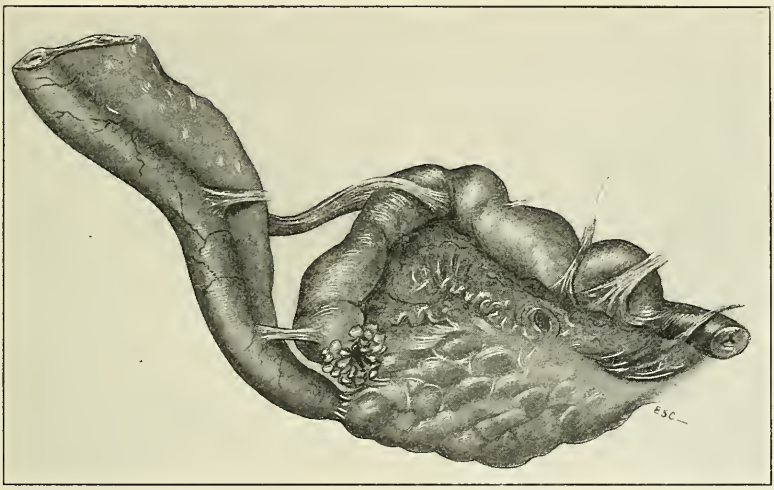
A *subserous fibroid* may be simulated by pyosalpinx when the tube is round, thick-walled, closely adherent to the uterus, and surrounded by a firm, sharply defined exudate.

The clinical history is important. In pyosalpinx there is a history of infection, either puerperal or gonorrheal, while in fibroids no such

history is obtainable. In subserous fibroids the tumor is round, sharply circumscribed, not tender to pressure, usually freely movable, and unilateral. In pyosalpinx the tumor is more elongated, less sharply defined, tender to pressure, immovable, and often bilateral. In pyosalpinx there are evidences of infection in the lower genital tract, while with fibroids such is not the case.

Parametritic exudates are often associated with pyosalpinx, and their differentiation may be impossible. The location and general contour of the swelling are the distinguishing features. The onset and general clinical manifestations closely simulate each other.

FIG. 327



Appendix adherent to tube and ovary in pregnancy.

A pyosalpinx is often bilateral, while a parametritic exudate is commonly unilateral. The former lies on a higher level at the side of or behind the uterus, while the latter lies low in the pelvis in direct contact with the vault of the vagina, running from the sides of the uterus directly outward. A pyosalpinx is more sharply circumscribed and is retort- or sausage-shaped. A parametritic exudate is ill-defined.

Ovarian and parovarian cysts may closely resemble a hydrosalpinx. The diagnosis must be reserved for an exploratory incision. Hydrosalpinx is more often bilateral and elongated, and is more limited in size.

New-formations of the tubes are very rare as compared with inflammatory lesions. The presence of ascites associated with tubal swellings speaks in favor of malignant new-formations of the tubes.

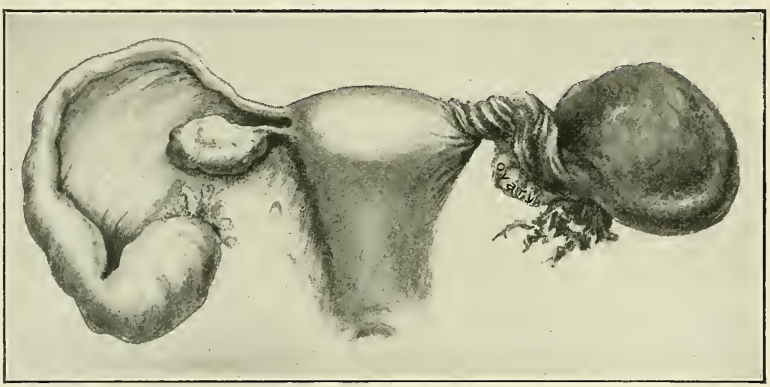
For the differential diagnosis of salpingitis from tubal pregnancy, see Chapter IX.

Twisted Pedicle of a Sactosalpinx.—It is possible for a sactosalpinx to twist upon its long axis. Anspach[1] has contributed an admirable discussion on "Torsion of Tubal Enlargements." None of the cases had been correctly diagnosticated before opening the abdomen. They were mistaken for appendicitis, ectopic pregnancy, twisted pedicle of an ovarian cyst, strangulation of the bowel, and gynatresia.

From one to four twists have been found in the pedicle, and the circulatory disturbances may be sufficient to cause gangrene.

It is hardly conceivable that the normal tube can twist upon its long axis, but when the outer end of the tube is enlarged and not adherent, conditions are favorable for twisting at the pedicle of the distended ampulla of the tube. The exciting and predisposing causes are the same as found in the twisting of the pedicle of an ovarian cyst. (See Ovarian Tumors.)

FIG. 328



Anspach's case of right, twisted pyosalpinx. Left, tuberculous pyosalpinx.

III. **Tuberculous Salpingitis.**—**Etiology.**—In this country our knowledge of tuberculosis of the tubes is largely contributed to by Williams, Penrose, and Edebohls.

The following statistics are from Veit:

Wenkel found tuberculosis 5 times in 575 cases.

Donhoff found tuberculosis 14 times in 509 cases.

Schramm found tuberculosis 34 times in 3389 cases.

Rosthorn found tuberculosis 2 times in 40 cases.

Williams found tuberculosis 7 times in 91 cases.

Martin found tuberculosis 17 times in 620 cases.

The above constitute a sum total of 79 in 5224 cases, or 1 case of tuberculous salpingitis in 66 abdominal sections.

Kundrat in 140 abdominal sections for the removal of diseased uterine appendages, found tuberculous salpingitis in 4 cases and tuberculous endometritis in 1 case.

[1] Amer. Jour. Obst., October, 1912.

Williams is undoubtedly correct in his statement that tuberculosis often goes unrecognized in a catarrhal or suppurative salpingitis for want of microscopic and bacteriological examinations.

At the Johns Hopkins Hospital in two years' time 8 per cent. of the tubes removed for inflammatory lesions were found tuberculous.

The great frequency of genital tuberculosis, as a primary lesion in the tubes, is shown in the statistics of W. Meyer, who reports 67 cases of primary tuberculosis of the genital tract, of which 57 were primary in the tubes.

We recognize a primary and secondary tuberculous salpingitis. Hegar, in his monograph of 1886, speaks of ascending and descending infections. The ascending form may be primary or secondary. The descending is always secondary.

Avenues by Which the Tubercle Bacillus Gains Access to the Tubes.—1. *By the blood current* (metastatic invasion), as found in secondary involvement of the tubes from a primary focus in the lungs, in the absence of a tuberculous lesion in the omentum, mesenteric glands, peritoneum, or bowel.

2. *By continuity of tissue*, either from the peritoneum or the uterus. In 194 cases of secondary tuberculous salpingitis the peritoneum was primarily involved 110 times (Meyer). When the tube is adherent to the bowel at the site of a tuberculous ulcer, the infection may pass directly from the bowel to the tube without involving the peritoneum. Such infections are usually mixed with the colon bacillus. Emmet described a case in which the tubercle bacillus travelled from the uterus through the tube and attacked the peritoneum, leaving the tube free.

3. *By way of the lymph current* tuberculosis may be conveyed from the lower genital tract through the broad ligaments without passing through the uterus.

The infection is conveyed to the genital tract by the examining fingers, instruments, and coitus. Tuberculosis may be conveyed from the husband to the genital organs of the wife, even though his sexual organs are normal.

The infection may travel direct to the tubes without attacking the uterus, vagina, or vulva.

As predisposing causes may be mentioned age, the puerperium, and inflammatory lesions of the tubes. Tuberculous salpingitis may be found at any period of life from infancy to old age, the greatest number occurring from fifteen to thirty years of age. The age limits are wider than in any of the other forms of tuberculosis. The puerperal uterus, and particularly the placental site, is especially susceptible to tuberculous infection.

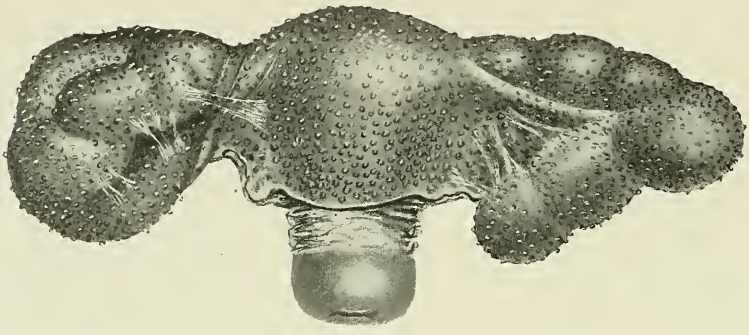
Inflammatory lesions of the tubes are likely to have tuberculosis engrafted upon them. Thus there are mixed infections of the tubercle bacillus, with the gonococcus, staphylococcus, streptococcus, and colon bacillus.

Anatomical Diagnosis.—As in other forms of salpingitis there is an acute and chronic stage.

Acute tuberculous salpingitis is seldom encountered. The tube resembles the catarrhal form. There is a slight increase in the size of the tube, together with marked congestion; the mucosa is swollen, and the secretion increased. The entire wall of the tube is infiltrated with small round cells, and in addition to these changes, which are those of acute catarrhal salpingitis, giant cells, tubercles, and tubercle bacilli are found in the mucosa and, to a lesser degree, in the muscularis. The lesion is more pronounced in the fimbriated end. The secretion collected in the lumen may be serous, bloody, or purulent.

From the acute stage the lesion may merge into a chronic stage, resembling chronic catarrhal or chronic suppurative salpingitis.

FIG. 329



Tuberculosis of the uterus, tubes, and ovaries. The surface of the uterus, tubes, and ovaries is covered with miliary tubercles by direct extension from the peritoneum. The appendages are matted and enlarged (tuberculous salpingitis and ovaritis).

Miliary tubercles may aggregate to form large tubercles and nodules, which in turn may undergo caseous degeneration. The lumen of the tube may be filled with caseous material. A tuberculous pyosalpinx may form after the closure of either end of the tube.

There is no way of distinguishing tuberculosis of the tubes either in the acute or chronic stage from catarrhal or suppurative salpingitis, except by the discovery of tubercles, giant cells, or tubercle bacilli. For this reason tuberculosis in a tube is often overlooked.

Gray or yellowish-gray tubercles, range in size from a miliary tubercle to a hazel-nut; they may be seen on the surface of the tube and on the peritoneum near by. Adhesions about the tube are usually firm and extensive.

Williams describes a chronic fibroid tuberculous salpingitis in which there is a marked fibrous hyperplasia in and between the tubercles. Caseous degeneration is absent. This is a very chronic form, and may be regarded as a healing process.

Calcification of the tuberculous product in the tubes is described by Kolb, Penrose, and Rokitansky.

Clinical Diagnosis.—Tuberculous salpingitis may be suspected when one or both tubes are found to be enlarged and tender to pressure, and the possibility of gonorrheal or puerperal infection can be excluded. The presence of tuberculosis elsewhere in the body or in the husband, or a tuberculous family history, suggest the cause of the lesion in the tube.

In primary tuberculous salpingitis the symptom of greatest clinical importance is prolonged and painful menstruation.

FIG. 330

Tuberculous tuboövarian abscess. The tube and ovary are distended with pus, and together form a retort-shaped mass the size of a fetal head. The wall of the cyst is thick and covered with dense adhesions. (Specimen removed by Dr. J. Clarence Webster.)

The functions of the bowels and rectum are frequently disturbed. Abdominal ascites is found in about 15 per cent. of cases. An evening rise of temperature and increase in the pulse-rate are significant. As a diagnostic test, tuberculin may be administered, but the test is not reliable.

The local findings do not differ at first from those of acute and chronic salpingitis. Later nodules may be occasionally felt on the surface of the tube. There is nothing in the conjoined examination to positively identify a tuberculous tube.

Hegar lays great stress upon the peculiar condition of the middle

third of the tube, which presents firm, nodular swellings. In the absence of peritonitis there are no findings differing materially from those of salpingitis in general. The finding of tuberculous peritonitis naturally suggests the presence of tuberculosis in the tubes. An exploratory curettage may disclose tubercles in the scrapings.

In favor of tuberculous salpingitis the following data may be given:

1. The diagnosis of chronic salpingitis.
2. Tuberculous lesions elsewhere in the body.
3. Tuberculosis in the husband, particularly when involving the sexual organs.
4. Family history of tuberculosis.
5. Salpingitis in virgins (90 per cent. are said to be tuberculous).
6. Tubercle bacilli in the leucorrheal discharge or in scrapings from the uterus.
7. Ascites.

Syphilis of the Fallopian Tubes.—Literature on syphilis of the tubes is scant, and cases are of rare occurrence. Nevertheless three authentic cases are described by Ballentyne and Williams, Donhuff, Bouchard, and Lepine.

Donhuff discovered the usual changes of catarrhal salpingitis in a postmortem examination of a baby, nine days old, which had died of syphilis.

The case recorded by Ballentyne and Williams was a seven months' child. There were numerous small gummata scattered throughout the tube wall and obliterating the lumen.

Bouchard and Lepine reported a case, aged forty years. Death was from syphilis. There was a gumma in each tube the size of a hazel-nut, and the lumina of the tubes were occluded.

Actinomycosis of the Fallopian Tubes.—We know little of actinomycosis of the tubes. Zemann, Stewart, Muer, and Granger have contributed all that is now known. In the reported cases the lesion was both primary and secondary in the tubes.

Actinomycosis is probably always a secondary infection in the tubes. The infection takes place from the intestinal tract, especially from the appendix, by continuity and penetration.

To the unaided eye the lesion presents the appearance of tuberculosis. In long-standing cases the abundant supply of connective tissue formed in and about the appendages may suggest the possible presence of a tumor of some sort.

Diagnosis.—The diagnosis can only be made by repeated bacteriological examinations of the contained secretions.

When the affection is circumscribed the prognosis is favorable. The treatment consists of radical removal. Large doses of the iodide of potassium should be given following the operation.

Parasites of the Fallopian Tubes.—Echinococci have been found in the tubes, the infection being secondary to that of the abdominal viscera, the pelvic bones, and the paraproctal connective tissue. Benoit reported eighty cases found in the literature.

TREATMENT OF INFLAMMATORY DISEASES OF THE TUBES

Non-operative Methods of Treatment. — Acute Salpingitis. — The treatment of acute inflammations of the tubes is essentially that of acute pelvic inflammation in general.

Rest.—Rest is enjoined in view of limiting the infection to the tube and preventing its spread to neighboring structures. Manipulations of the tubes in the early stages of infection are dangerous, because at such times the abdominal end of the tube is not securely closed and the infectious secretions may be stripped from the tube into the pelvic peritoneal cavity. For this reason no unnecessary pelvic examinations should be made and all operative measures should be proscribed unless drainage per vaginam is demanded for the relief of septic intoxication and pain.

Depletives.—Depletives should be used throughout the acute stage and long after the acute inflammatory reaction has subsided. For the application of hot douches and ichthyol and glycerin tampons see Chapter XI. If these methods are persisted in the results will often be most gratifying. The progress of the infection may be checked, exudates within the lumen of the tube and tube wall may be absorbed, and if the inflammatory process has not gone on to the destruction of cellular elements, and the building up of newly formed connective tissue, it is possible that the tube may not only be restored to functional activity, but to a perfectly normal anatomical condition.

In addition to the application of douches and tampons, hot hip packs, hot fomentations, and ice-bags are of service in relieving pain.

Regulation of Diet and Bowels.—The diet should be plentiful and nutritious, and the bowels kept freely open with saline cathartics and enemata. As a rule, anodynes are not demanded.

Salt Solution.—When septic symptoms are manifest, enemata of normal salt solution will lessen the toxic symptoms and add to the comfort of the patient. The functions of the bowels, skin, and kidneys are accelerated, the disturbances of the stomach due to toxins are alleviated, and pain is lessened.

Fraub, of Amsterdam, reported 70 per cent. of cures of salpingo-ovaritis without operative intervention. In these cases the uniform treatment was as follows: "Complete rest in bed and the application of an ice-bag as long as there was any fever; the acute symptoms past, warm vaginal injections (45° C.), vaginal tampons, glycerin and warm water compresses on the lower part of the abdomen. The duration of the treatment varied from three weeks to several months; the average duration could be rated at about six weeks." The author does not claim complete cure in all of these cases, but in every case the women were wholly relieved of their symptoms. In a limited number of these cases, amounting to 433, there were slight relapses. Fraub holds that over one-half the cases of salpingoövaritis necessitate no operative interference.

Chronic Salpingitis.—The question might be asked, Should all tubes, the seat of chronic inflammation, be sacrificed? This is the general rule of practice, but in view of the fact that so large a percentage of these cases are brought to the state of functional cure by the exercise of conservative measures, it is apparent that surgery should not be invoked until non-operative means have been given an extended trial. Surgery cannot replace a diseased tube by a normal tube, hence it follows that the removal of an unoffending lesion of the tube can serve no good purpose.

The severity of the symptoms in no way corresponds to the extent of the lesion in the tubes. There may be an accumulation of pus in the tubes in the absence of symptoms, and there may be serious complaint from an apparently insignificant lesion in the tubes.

As a general proposition, so long as a salpingoövaritis lets the patient alone we should let it alone, so far as surgery is concerned.

In the chronic stage of salpingitis the treatment is directed toward relief from annoying and distressing symptoms, and so far as possible, to the restoration of the diseased tube to the normal. When these efforts, faithfully and intelligently directed, have failed to bring about the desired results, it is time for surgical intervention, but not until then.

The conservative measures applied in the treatment of chronic salpingitis are as follows: Vaginal douches of water at 110° F., twenty minutes in duration and repeated twice daily, are given in the recumbent position. Glycerin (93 parts) and ichthyol (7 parts) tampons are applied daily.

Douches and tampons afford the most effective means of depleting the congested pelvic tissues, and by their use, tenderness and pain are relieved, inflammatory swellings are reduced, and the functions of the tubes and neighboring organs are in part or wholly restored. Under this treatment, extending over a period of one year, the author has seen a case of bilateral pyosalpinx arrive at a functional cure, and the patient had a subsequent pregnancy and a successful delivery. Pelvic massage, properly directed and persisted in for the requisite time, will bring favorable results in selected cases, but in America this method of treatment has found little favor. The author has personally found little satisfaction in it. (See page 215.)

Pressure therapy (see page 220) is of still less value in the treatment of salpingitis because of the high location of the tubes. Freedom from violent exercise and careful regulation of the bowels should be enjoined.

Conservative Operations on the Tubes.—The object of practising conservatism in operating upon the Fallopian tubes is to maintain, or provide for, the function of childbearing. The one function possessed by the tubes is that of transmitting the ovum from the ovary to the uterus, and it is to restore the lumen of the tube throughout its entire course that surgery is invoked.

It was formerly the custom to remove the tubes together with the ovary, but it has been repeatedly demonstrated that the ovum may

pass from an ovary to the tube of the opposite side and there be fecundated, and either remain in the tube and develop a tubal pregnancy or pass through the tube to the uterus and there develop a uterine pregnancy. From these facts we have learned to conserve the normal tube and even a small portion of the uterine end of a normal tube when the ovary of the corresponding side has been wholly sacrificed and there is left all or a part of the ovary of the opposite side.

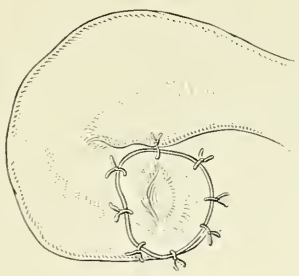
The surgical axiom, "save what can be saved," applies to the surgery of the tubes when the uterus and at least a part of one ovary are left intact. When the body of the uterus or both ovaries are removed the tubes can serve no good purpose.

In tubal pregnancy there is no place for conservative dealing with the pregnant tube; it should be removed *in toto*. (For further discussion see Chapter IX.)

Chronic inflammatory diseases of the tubes afford possibilities as well as uncertainties in conservative operations.

Experience teaches that simple catarrhal inflammations of the tubes, when treated tentatively, not infrequently resolve into a normal state; and it has been observed that purulent infections of the tubes may eventually cease to inconvenience the individual and may not interfere with the occurrence of pregnancy. I have had one patient of bilateral pyosalpinx who was under treatment by douches and tampons for a year and who subsequently bore a child with no untoward results. Martin reports two such cases.

Fig. 331



Salpingostomy. Mucosa stitched to the serous covering of the tube with fine plain catgut.

We frequently observe cases in the acute and subacute stages of a pelvic infection with the uterus and appendages matted and pus in and about the tubes, and believe them to be hopelessly involved; yet under tentative treatment they cease to create disturbance, and become so nearly normal as to require little or no surgical interference. *It therefore behooves one to be guarded in his surgery of the tubes lest he remove that which may serve a good purpose.*

Adhesions about the tube may be severed without sacrificing the tube, provided the lumen of the tube is patent. When the fimbriæ are matted and serous secretions have accumulated in the tube, without altering the structure of the tube wall, the fimbriæ may be teased apart or the fimbriated end resected. Whenever there is a possibility of a latent infection resident in the tubes, no such conservative measures are permissible. Fig. 331 shows the completed operation of salpingostomy, the fimbriated end of the tube having been amputated and the mucosa stitched to the serous covering of the tube. In this operation two essential details are to be observed: (1) The mucosa must be turned out to form an ectropion, thereby preventing partial or complete

closure of the tubal opening, and (2) the improvised fimbriated end must be in close proximity to the ovary.

J. Clarence Webster resected the fimbriated end of a tube, and at a later date found, upon opening the abdomen, that fimbriæ had reformed at the resected end of the tube.

The effort has been made to conserve part or all of a tube distended with pus, blood, or serum. Stripping the tube of its contained blood or pus and irrigating the tube with sterile normal salt solution by means of a small cannula inserted into the abdominal end of the tube has been advised and practised by some operators. Such conservatism is not justified.

What Are the Limitations and Disadvantages of Conservatism?—The menopause marks the end of usefulness of the Fallopian tubes, because their only function, so far as known, is that of transmitting the ovum from the ovary to the uterus.

The following objections to the conservative treatment of diseases of the tubes have been advanced:

1. The return of disease in the resected tube.
2. The uncertainty of restoring the functions of the operated tube.
3. Failure to effect perfect relief from symptoms.
4. Liability of the disease recurring in the opposite side.
5. The danger of ectopic pregnancy.

The above recorded objections do not prevail when the indications for operative interference are well grounded, and when it is the desire of the patient that the healthy portions of the organ should be conserved.

Contra-indications to Conservatism.—The advanced age of the patient in the presence of diseased tubes, and in the presence of pus, malignancy, or tuberculosis at any age, are the principal contra-indications to the saving of a portion of the tubes.

Radical Surgical Treatment.—*Is it advisable to remove the healthy tube in the presence of unilateral salpingitis?* The pioneer worker in surgery of the uterine appendages, Lawson Tait, answered this question in the affirmative. Such a position is no longer tenable, though it applies with no little force to gonorrheal and tuberculous salpingitis, inasmuch as these infections will almost invariably attack the opposite tube. The practice of removing the apparently healthy tube in unilateral, gonorrheal, and tuberculous salpingitis is the more permissible in view of the fact that the tube, which to the naked eye is apparently healthy, may be the seat of an initial infection. Experienced operators have realized the truth of these assertions by the recurrence of the infection in the tube, which was not removed because it was apparently normal at the time of the primary operation.

The established rule is to remove the opposite and apparently healthy tube in all cases of unilateral salpingitis of tuberculous or gonorrheal origin, but in no other cases. This is a doubtful rule of practice in operating upon young women.

Should the uterus be removed together with the tubes in bilateral salpingitis? In answering this question the author would advance the following rules for the guidance of the surgeon:

The uterus should be removed together with the inflamed tubes:

1. When the uterus is metritic and subinvoluted.
2. When adhesions bind the surrounding viscera to the uterus.
3. When the uterus contains myomata.
4. When the uterus is cancerous.
5. When the infection is tuberculous.

In young women I am constrained to be more conservative in dealing with the uterus and do not remove it when its walls are not thickened and extensive adhesions do not bind the uterus to neighboring structures, and finally, when a part or all of the ovaries are not removed. Thus atrophic changes do not follow, the menstrual function is preserved, and the effect upon the well-being of the individual is the best that can be obtained. While such is the author's practice, he is sometimes confronted with cases which persist in troublesome leucorrhea and menstrual disorders which do not easily respond to conservative treatment and may eventually demand hysterectomy. Notwithstanding these disappointments, he is of the opinion that the uterus should not be sacrificed in young women unless there is evidence of a deep-seated infection in the uterine musculature or that it contains other morbid products, such as fibroids and cancers, which in themselves call for hysterectomy.

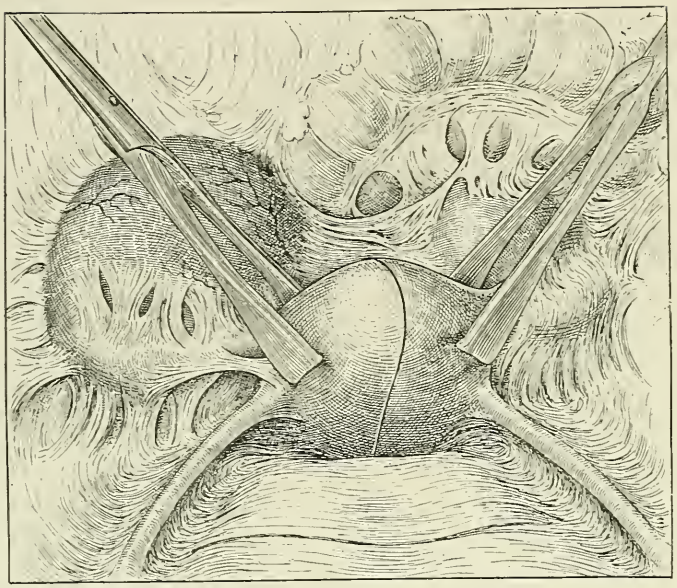
From a surgical point of view the removal of the uterus together with the inflamed appendages is the most satisfactory. Better hemostasis is obtained by securing the uterine arteries; raw surfaces are diminished, drainage is more readily established, and the duration of the operation is not materially lengthened. It is sometimes easier to remove the uterus, together with adherent appendages, than to dissect out the appendages and leave the uterus.

The suggestion of Kelly is worthy of consideration in this respect. He advises the removal of part of the body of the uterus in order to retain the menstrual function. When the tubes have been removed, but not all of the ovaries, a heavy uterus, or one that is adherent or contains fibroid tumors in the fundus, may be amputated at a point above the external os and thereby preserve the capacity of menstruation. (See page 442.)

The uterine splitting operation, as advocated by Howard Kelly, is applicable to those cases in which the uterus, together with the distended tubes and ovaries, are firmly matted by adhesions. By first splitting the uterus in the median line and removing either half at the level of the internal os, the adherent appendages can be readily attacked. (See Figs. 332, 333, 334, 335, 336, and 337.)

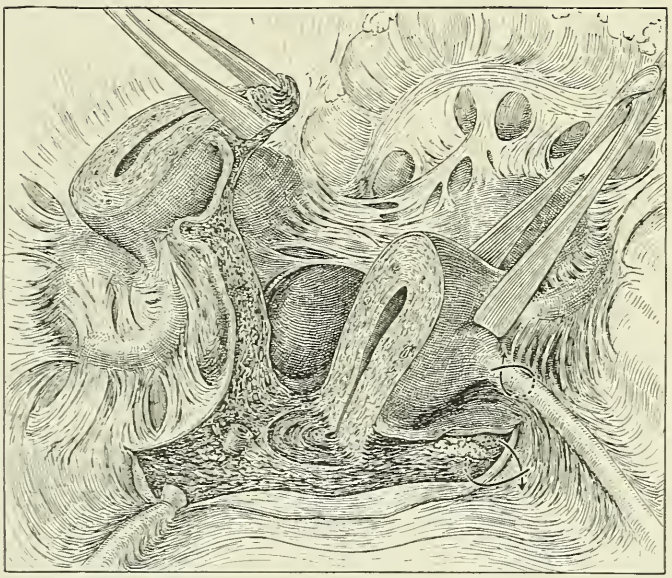
Operative Treatment.—When conservative treatment of the inflamed tubes has failed to effect a cure and the patient continues to be distressed by the existing lesion, surgical intervention may be invoked.

Fig. 332



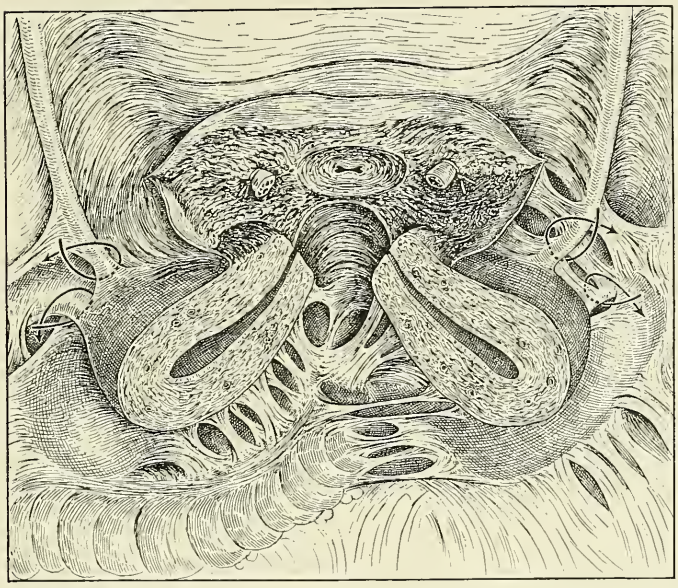
Uterine splitting operation. The uterus is grasped at either horn by tenacula. A vertical incision is made in the median line from the fundus to the internal os. (Modified from Kelly.)

Fig. 333



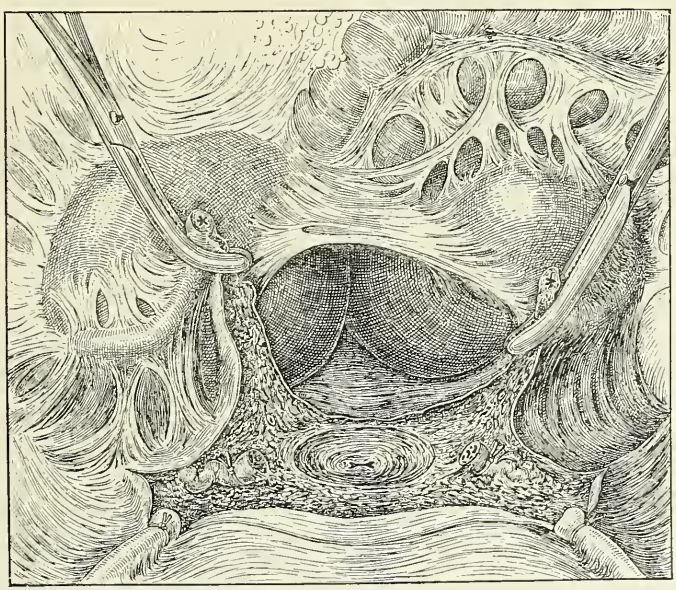
The body of the uterus is amputated on the right side at the cervical juncture. The uterine artery is grasped with forceps, cut, and ligated. The round ligament, ovarian ligament, and Fallopian tubes are ligated and severed near their attachments to the uterus.

FIG. 334



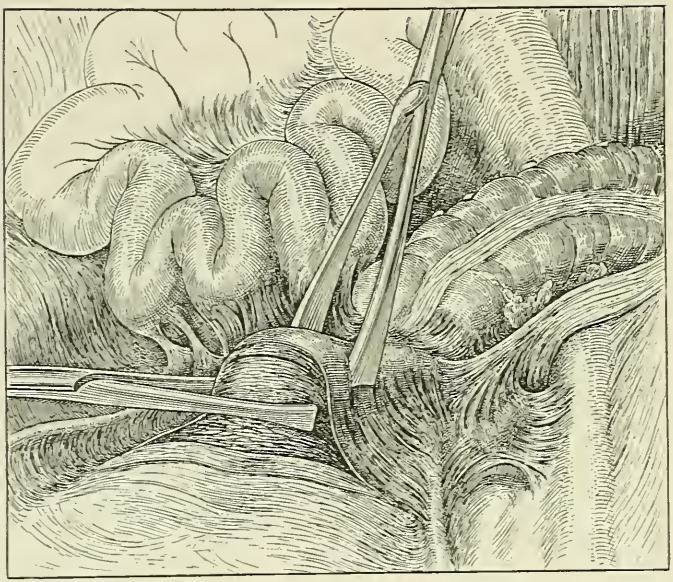
Both halves of the uterus are severed from the cervix. The round ligaments, tubes, ovarian ligaments, and uterine arteries are secured by ligatures preparatory to severing all attachments of the uterus.

FIG. 335



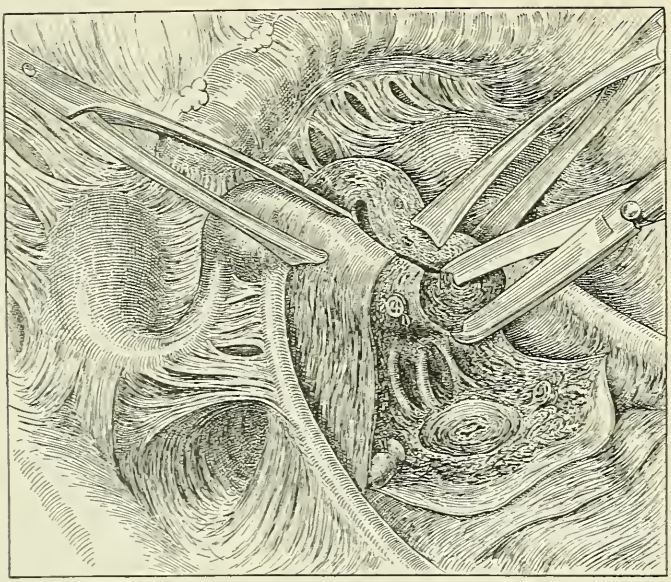
The body of the uterus is removed, providing free access to the enlarged and adherent appendages.

Fig. 336



The uterus is retroverted and firmly adhered. The peritoneum is stripped downward from the supravaginal portion of the cervix preparatory to amputating the cervix from before backward.

Fig. 337



The uterus is amputated at the cervix and is bisected from below upward. The remaining steps of the operation are as in Figs. 333, 334, 335, 336.

The belief that all inflamed tubes call for operative interference is, happily, no longer entertained by gynecologists. They have learned that some of these tubes undergo spontaneous healing, and that not a small proportion cease to give serious trouble when managed conservatively. These observations have led the profession to interfere surgically in salpingitis only after conservative measures have been given a fair trial and without avail.

Catarrhal Salpingitis.—In the acute stage of catarrhal salpingitis only conservative measures should be practised. The patient should be confined to bed, the diet restricted, ice applied to the abdomen, the bowels regulated, and local depletive measures employed. Long hot vaginal douches, given at intervals of four to eight hours, will do much to allay the inflammatory reaction.

When not too painful, glycerin and ichthyol vaginal tampons may be effectively applied. These should be applied daily for six to eight hours. Ordinarily the acute stage will pass in three to five days, and the tubes either return to normal or become chronically inflamed.

No surgical intervention should be instituted in the acute stage of catarrhal salpingitis for the reason that a cure by the exercise of conservative measures is always possible, and because of the dangers involved in an abdominal operation upon tubes containing virulent microörganisms. It is further advised to avoid so far as possible all pelvic manipulations in such cases, for fear of exciting the infection to extend from the tubes to the peritoneum. All digital and instrumental manipulations should be restricted to the minimum, and all intra-uterine manipulations should be proscribed unless for the removal of placental tissues and infected tumors.

Chronic Catarrhal Salpingitis.—Conservative measures should be instituted in the treatment of chronic catarrhal salpingitis. Hot vaginal douches, glycerin and ichthyol tampons, pelvic massage, and other means may be employed, with benefit; but when given a fair trial, and without affording relief, it is then permissible to resort to surgical measures. The surgery of chronic catarrhal salpingitis holds out the opportunity for the exercise of conservatism. It is not imperative in all cases that all of one or both tubes should be removed. It may be that the separation of the matted fimbriæ and the expressing of contained secretions is all that is required.

Again, a portion of the tube may be resected, leaving a healthy portion to provide for the possibility of childbirth.

When both tubes are affected, conservatism should be practised.

The removal of one or both tubes is imperative when the uterine end of the tube is so disorganized as to no longer functionate, and when the ovaries have been removed or are incapable of carrying on their function. There is not the need of exercising conservatism in the surgery of the tubes when it is apparent that sterility is inevitable.

When it is believed that pathogenic microörganisms exist in the tube, it is not safe to leave a portion. For the technic of the operation see the following pages.

Hydrosalpinx.—A hydrosalpinx may exist without local or general disturbances, and in such cases it cannot be said that surgery should be invoked. There are reasons, however, for intervening surgically which are worthy of consideration. We have learned that hydrosalpinx is sometimes, if not frequently, the result of a congenital closure of the fimbriated end of the tube with subsequent accumulation of the tubal secretions. When bilateral, sterility is the result and relief may be possible by resecting the distended portion. This is only possible when the distention involves the distal portion of the tube and cannot be considered in the presence of other and irreparable causes of sterility.

The operative treatment for hydrosalpinx consists in the removal of part or all of the distended tube. When it is possible to leave a portion of healthy tube this should be done, provided other conditions are favorable to childbearing.

When the tube is more or less distended, and particularly when there are inflammatory changes in and about the tube, the complete removal of the tube should be made. For the technic of salpingectomy see page 478.

Hematosalpinx.—As a general proposition a hematosalpinx should be removed. There is, however, abundant opportunity for exercising conservatism in the saving of healthy portions of the tube. This should not be attempted in the presence of infection within the tube and of irreparable lesions of the ovaries and uterus.

Chronic Purulent Salpingitis.—No attempt should be made to eradicate the tube during the acute suppurative stage, and operative intervention in the chronic stages should be deferred until conservative measures have been well tried. Rest, hot vaginal douches, poultices, glycerin and ichthyol tampons may do much to give relief, and may produce a functional cure, and should be given an extended trial before resorting to surgery. If no improvement follows these treatments, operation is indicated.

Salpingitis is rarely fatal, hence the opportunity is at hand to give conservative, tentative treatment a fair trial.

Efforts to empty the pus through the uterus by curettage and massage are to be condemned as futile and dangerous.

Removal of the entire tube is the only alternative when tentative measures have been tried and have failed.

Vaginal Drainage for Pyosalpinx.—The following are safe and reliable guides in the management of pyosalpinx:

1. In all recent accumulations of pus within the tubes which call for surgical interference, only vaginal drainage should be considered.

2. In all old accumulations of pus within the tubes which are favorably located for drainage through the vagina, the safest rule to follow is to establish such drainage and await the clearing up of the abscess cavity before proceeding with the removal of the tubes through an abdominal incision.

Vaginal drainage of pus located in the tubes is not a simple procedure

from a technical point of view, nor is it a safe one in the hands of the inexperienced. Attempts to establish drainage have repeatedly conveyed the infection to the free peritoneal cavity, and with fatal results. The author views the operation most gravely, and particularly so in cases of acute infection.

It has happened in the experience of the operator that vaginal drainage of pus tubes has brought about a complete and lasting functional cure when, had the abdominal route been chosen, the tubes and possibly the uterus and ovaries would have been sacrificed.

Vaginal drainage is feasible when the patient is too depressed to withstand the shock of an abdominal operation. Because of the much lower mortality and the opportunity afforded for the preservation of tissues, vaginal drainage is greatly to be preferred to the more radical abdominal operation in all cases in which the pus can be readily reached per vaginam.

Technic of Operation.—The following is the usual method employed by the author: After thorough sterilization of the field of operation the vagina is exposed by a weighted vaginal speculum; the posterior lip of the cervix is grasped by tenaculum forceps and gentle traction is made upward and outward by an assistant. The operator grasps the vaginal wall close to its reflection upon the posterior wall of the cervix with long rat-tooth tissue forceps. A transverse incision is made with long sharp-pointed scissors through the vaginal wall and close to the cervix. This incision is about one inch in length. The finger is inserted through the incision, and by a gentle stripping and boring process the finger finds its way in the direction of the abscess. When pus is reached, the two index fingers are inserted and the wound stretched to admit of free drainage.

When the pus ceases to flow, a careful exploration of the pelvic cavity should be made to detect and evacuate other accumulations of pus within the pelvic cavity.

When all pus cavities have been evacuated and a free avenue for subsequent drainage provided, the cavity is then loosely packed with washed iodoform gauze. This pack is removed at the end of forty-eight hours and thereafter the cavity is irrigated with sterile salt solution.

It frequently happens that drainage is not always free; in such event the incision should be spread either with forceps or finger.

The following precautions should be noted:

1. Before attempting to drain, a bimanual examination should be made to determine the exact size and location of the abscess.

2. The incision should be made close to the cervix, and in burrowing to the abscess the finger should be kept in close proximity to the uterus for fear of injuring the rectum.

3. The greatest caution must be exercised in all manipulations for fear of liberating pus into the free abdominal cavity.

4. In exploring the pelvis with the finger there is danger of perforating a loop of bowel and thereby creating a distressing fecal fistula.

5. The cavity should not be swabbed with gauze. No irrigation should be employed for fear of washing infected material into the abdominal cavity.

6. Rubber drainage tubes and tightly packed gauze are dangerous in view of possible pressure necrosis of the bowel wall.

7. When the abscess lies too high to be reached by the finger, an experienced operator may pass closed dressing forceps in advance of the finger. The forceps are passed into the abscess and opened to spread the perforation in the abscess wall. In the hands of the inexperienced operator this is a dangerous procedure.

8. If the infection is tuberculous, nothing short of a radical abdominal operation will effect a cure, and this should be done after the pus has well drained.

Tuberculous Salpingitis.—The author believes that the only safe rule to follow in tuberculous salpingitis is to remove the affected tubes. (For further discussion see page 542.)

In the presence of a general peritoneal involvement the effort should be made to remove the primary focus, which in a large percentage of cases is found in the tubes. If a tuberculous lesion of the lungs is found not to be so far advanced as in itself to make recovery impossible, this complication should not deter the surgeon from eradicating the pelvic infection. Having removed the pelvic infection the patient should be placed under favorable hygienic conditions, such as are prescribed for tuberculosis in general.

It is well to emphasize the importance of prophylaxis in genital tuberculosis. It is known that the infection can be conveyed by instruments and examining fingers and by the tuberculous husband; the precautionary measures to be observed are self-evident.

Technic of Operations on the Tubes.—When adhesions close the abdominal opening or bind the tube to surrounding structures, and in the absence of structural changes in the tube wall, these adhesions may be carefully severed, leaving the tube intact and in the normal position.

Salpingostomy or Amputation of the Tube at the Isthmus or Ampullary Portion.—Two points should be emphasized in this operation: (1) The artificial opening in the tube must closely approximate the ovary, and (2) an ectropion of the tubal mucosa must be produced by stitching the mucosa to the peritoneal covering of the tube. This is done by plain sterile catgut No. 1.

This procedure is not without some danger. Cases have been reported in which postoperative hemorrhage has occurred, and infection from the tube has followed, and the newly formed osteum has again closed by adhesions.

Salpingectomy or Removal of the Tube.—The tube may be removed either by the abdominal or vaginal route.

By the Abdominal Route.—The usual suprapubic, mesial incision is made. Adhesions binding the tube may be broken by the fingers or severed by scissors under the guidance of the eye. With long forceps

the infundibulopelvic ligament may then be grasped and the tube delivered into the abdominal incision. If firm adhesions bind the tube to the bowel it may be necessary to strip off the peritoneal covering of the tube, together with the bowel, to prevent injury to the bowel wall. A No. 2 plain catgut ligature is made to transfix the infundibulopelvic ligament, taking care not to embrace the ovarian vessels if the ovary is to be left intact.

Holding the tube with fingers or forceps, the attachments of the tube are severed with scissors from within the ligature placed about the infundibulopelvic ligament, and passing along the attachment of the tube to the broad ligament to the uterine cornua. The tube is then dissected from the horn of the uterus with a knife. All bleeding points are to be secured by forceps.

In purulent salpingitis it is best to amputate the tube from the uterus by the actual cautery. The severed broad ligament and open cornua of the uterus are then sutured with catgut. With a running suture of No. 1 plain catgut all bleeding-points are secured and raw surfaces are covered.

When the tube is adhered to the floor of the pelvis it is best to proceed with the excision at the horn of the uterus.

If the tube is greatly distended with pus and adherent, so that there is great liability of rupturing the tube, it is best to aspirate the contents before attempting to remove it.

After completing the operation the abdomen is closed without drainage, unless pus has been set free in the operation and much raw surface has been created by the severing of adhesions. When found necessary to drain, the proper procedure is to open through the cul-de-sac into the vagina, pass a strip of sterile or antiseptic gauze through this opening into the vagina, and pack the remaining portion of the gauze loosely in the pelvis, then to close the abdominal incision. At the end of forty-eight hours the gauze is removed through the vagina. When the drainage is done for a safeguard against infection the patient should be placed for several days in the Fowler position.

When, by the removal of the tube, the uterus has lost part of its support the round ligament should be brought over the horn of the uterus and stitched to the posterior surface. This procedure serves the double purpose of maintaining the uterus in its proper position and of covering the raw surface at the cornua.

When the ovary is diseased it is to be removed in part or *in toto*, according to the rules laid down in the following chapter.

By the Vaginal Route.—In the past too great enthusiasm has apparently been displayed in operating through the vagina upon the uterine appendages. In some cases this may be done satisfactorily, but when extensive adhesions exist the procedure is at best hazardous. The danger of injuring the bowel, of creating uncontrollable hemorrhage, and of leaving a diseased vermiform appendix are sufficient to condemn the operation in such cases. An imperfect recovery is sometimes obtained, due to the extensive raw surfaces left, which lead to the

formation of adhesions. In addition to these arguments in favor of the abdominal route is the greater degree of safety in abdominal operations which are performed under the guidance of the eye.

Hysterectomy in connection with the removal of badly infected appendages is much in vogue, and is discussed on page 471.

CIRCULATORY DISTURBANCES IN THE OVARY

Etiology.—There is a physiological hyperemia of the ovary during menstruation, coition, and pregnancy. The ovaries share in a general pelvic congestion, hence all embarrassments to the general circulation from diseases of the heart, lungs, kidney, and liver, from abdominal tumors, collections of fluid in the abdomen, and constipation will cause passive congestion of the ovaries.

In certain hemorrhagic diseases, such as scorbutus and purpura, there are hemorrhages into the substance of the ovaries. Hyperemia of the ovary is an accompaniment of all the inflammatory lesions in the pelvis. The more acute the lesion the greater the hyperemia. As remarked in the section on Descensus Ovarii, the ovary is congested.

Anatomical Diagnosis.—In hyperemia of the ovary there is a slight increase in size in all diameters and a more livid color. Following long-standing hyperemia there is an increase of the connective tissue. The tunica albuginea is thickened and the follicles, failing to rupture through the thick and resisting tissue, lead to follicular degeneration of the ovary.

FIG. 338

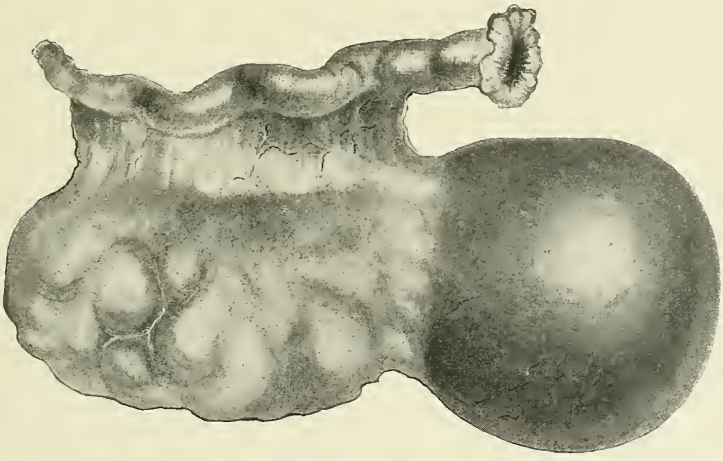
Hematoma of the ovary. (Hertzler.)

Hematoma of the Ovary.—Hematoma of the ovary is often of obscure origin. It is possible for hemorrhages to occur in the ovary as the result of any of the above-named causes for hyperemia. As an under-

lying factor there may be degenerative changes in the bloodvessels of the ovary. Such collections of blood are usually found in the follicles; hemorrhages into the interstitial spaces are less common. Virchow and Olshausen each report a case complicating scorbutus. Torsion of the tube and ovarian ligament may cause hemorrhages into the stroma and follicles of the ovary.

Martin reported 109 cases in which blood collections in the ovaries varied in size from that of a bean to a man's fist. Of this number 25 were between the ages of eighteen and fifty-two; 22 were not married; the right ovary was affected 47 times, the left 55 times, and both ovaries 32 times. In all but 8 cases there was more or less peritonitis, and 4 of the 8 had uterine fibroids, 1 chlorosis, 2 endometritis and metritis, and 1 practised masturbation. In 26 of the 109 cases a traumatic cause could be traced in the history, such as the passing of the uterine sound, the wearing of pessaries, and the replacing of the uterus. Hematoma is an unusual finding in an otherwise perfectly normal ovary. Any of the new formations and inflammatory lesions may accompany hematoma.

FIG. 339



Hematoma of the corpus luteum. The ovary is greatly hypertrophied, and at the distal end is a single protruding blood cyst the size of an English walnut, formed from a corpus luteum.

Hemorrhages into the substance of the ovary are found in one or more of three places: in the follicles, corpus lufeum, or connective-tissue spaces.

1. *Hemorrhages into the follicles* may distend them to the size of a man's fist. More than a single follicle may be involved. The stretched walls of the follicles, with their contained blood, have a bluish tint. The contained blood may or may not be coagulated, and is dark red or grayish brown. The inner surface of the follicles is smooth, though occasionally made uneven by coagulated blood adhering to the wall. Fatty degeneration of the epithelium lends a yellowish tint to the

inner surface. The contained blood may be wholly absorbed or converted into fibrin, which, by contracting, may obliterate the follicles. Occasionally the follicle bursts, and the blood escapes into the peritoneal cavity. The escaped blood has been known to set up a peritonitis, and cases are recorded in which the hemorrhage was fatal. Infection of the blood may give rise to abscess formation in the ovary.

2. *Hemorrhages into the corpus luteum* are identified by the corrugated lining membrane of lutein cells or by their granular appearance. Such bodies are single, and are located in the periphery of the ovary. Hematoma of the corpus luteum has been known to attain the size of a child's head.

In the hematoma of the corpus luteum the wall is more congested and thicker than in the preceding variety. On the inner surface of the cyst there is a deposit of fibrin, in the meshes of which are disintegrated blood and small round cells. Beneath this are the lutein cells, varying in number, size, and form according to the age and size of the hematoma. External to the lutein cells is the tunica externa, composed of fibrous tissue.

3. *Hemorrhage into the connective-tissue spaces* is less common. Such hemorrhages are often multiple, and are seldom of large size. Multiple punctate hemorrhages may be distributed through the stroma and add materially to the size of the ovary.

The blood is found in various stages of preservation. In follicular hematoma the epithelium lining the blood cyst may be well preserved, assuming a variety of shapes from cylindrical to flattened. Several layers may be found. In the larger hematomata there may be but a single layer of flat epithelium, and even this may partially or wholly disappear through pressure atrophy. Blood extravasations and congested bloodvessels may be seen in the tunica propria.

Clinical Diagnosis.—There may be no clinical manifestations. The ovary is usually tender to pressure. Pain in the ovary may radiate to the back and thighs. The pain is at its height during the period of premenstrual congestion, and abates when a free flow is established.

It has been said that when pelvic congestion is present and a throbbing pain develops in the ovary, with no elevation of temperature, it is to be inferred that a hematoma has developed in the ovary. A diagnosis can only be made on exploration of the ovary.

In a bimanual examination the ovary is invariably found enlarged, though it is seldom larger than a walnut. The consistency is tense and elastic.

Although sharply circumscribed the ovary is usually irregular in outline. It is found on a lower level than normal, often lying low beside or behind the uterus.

It is difficult and often impossible to differentiate hyperemia, hematoma, and inflammation of the ovary. The pain and tenderness may be equally intense, and there may be no distinction in the physical findings. In inflammation the symptoms are usually of longer standing and more pronounced. The history of the onset should be considered.

Treatment.—(See Treatment of Ovarian Tumors.)

INFLAMMATION OF THE OVARY (OÖPHORITIS, OVARITIS).

For practical, clinical purposes inflammations of the ovary will be classified as acute and chronic.

Acute Ovaritis.—Acute inflammation of the ovary is due to direct invasion of the ovary by bacteria or to the influence of their toxic products. Certain inorganic poisons (phosphorus, arsenic) act in a similar manner.

All the infectious diseases may be complicated by ovaritis, including the exanthemata, typhoid fever, cholera, pneumonia, influenza, dysentery, wound infections, gonorrhea, and tuberculosis.

The microörganisms found in the ovary under such conditions are staphylococci, streptococci, pneumococci, gonococci, typhoid bacilli, and actinomyces.

In all the above-named causes of ovaritis the same general anatomical changes follow, there being no essential difference in the anatomy of the various etiological forms.

Pfannenstiel considers acute ovaritis under the heads of septic and gonorrheal.

Acute Septic Ovaritis.—Acute septic ovaritis is a complication of puerperal sepsis, but a similar lesion may arise from the non-puerperal septic agencies above named.

The ovary is uniformly enlarged and reddened, and the stroma becomes infiltrated with a serous exudate and small round cells. The follicular epithelium degenerates, the ovum dies and is absorbed, and the liquor folliculi becomes turbid. Suppuration may follow, leading to the formation of abscesses in the corpus luteum, follicles, and interstitial spaces.

Resolution is the rule, and this is possible either by complete absorption of the exudate, leaving the ovary in a normal condition, or by atrophy of the connective tissue, with its subsequent contraction.

Acute Gonorrheal Ovaritis.—Acute gonorrheal ovaritis is rarely primary, and is almost invariably secondary to salpingitis. In exceptional cases the infection is conveyed from the cervix through the lymphatics of the broad ligaments to the hilum of the ovary.

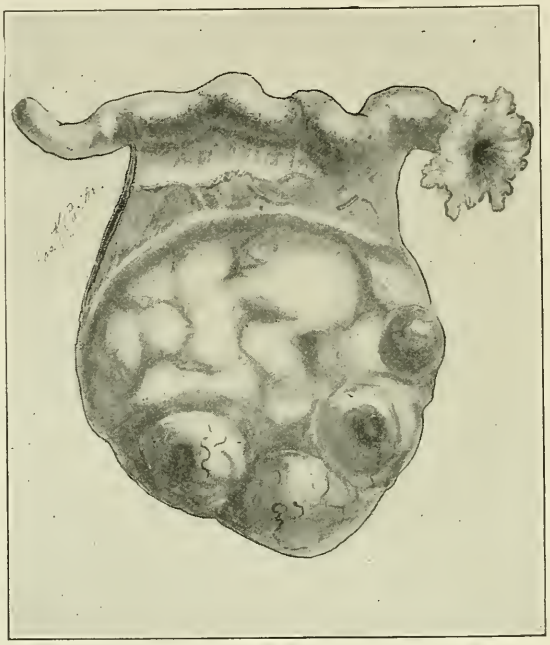
Wertheim has succeeded in demonstrating the gonococcus in the ovary.

Chronic Ovaritis.—Chronic ovaritis is a clinical term designating a long-standing lesion of the ovary, characterized by hyperplasia of the stroma and secondary atrophy of the parenchyma.

Chronic ovaritis may be the terminal stage of an acute infection of the ovary. Any condition causing prolonged congestion of the ovary will result in chronic ovaritis, such, for example, as sexual excesses, menstrual congestion, subinvolution, malpositions of the uterus, habitual constipation, incompetency of the cardiovascular system, pelvic and abdominal tumors, and disorders of the organs of digestion.

Cystic Degeneration of the Ovaries.—It may now be fairly stated that the profession in general has come to regard cystic degeneration of the ovaries in a less serious light than was first presented, but yet accords the lesion its rightful place among the morbid conditions of the ovary.

Fig. 340



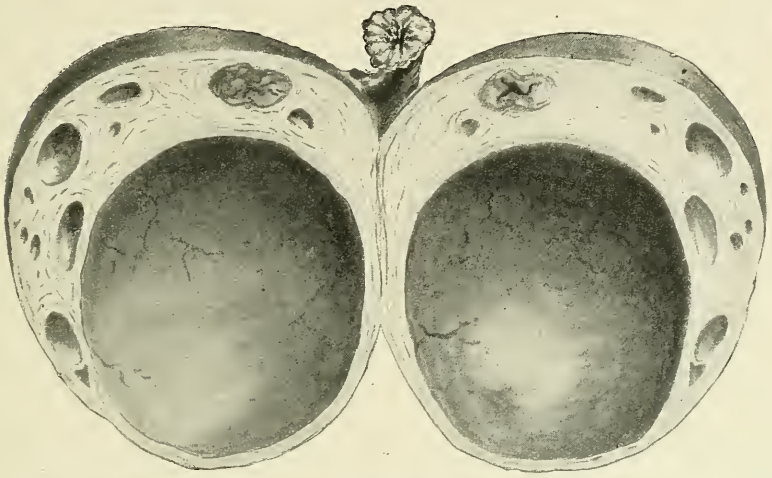
Chronic ovaritis with follicular degeneration.

I have made microscopic and clinical studies of 180 cases in which one or both ovaries were removed or resected for follicular degeneration. Of the 180 cases, 160 were operated by Dr. J. Clarence Webster; 20 by the author; only 39 of these cases were uncomplicated. In 141 of the cases the ovaries were operated in connection with other lesions. My observations have extended over a period of twenty-two months. From the clinical records I have tabulated the clinical signs which appeared to be directly referable to the ovary. In this I met with difficulty because of the frequent presence of associated lesions which often masked those ordinarily ascribed to the ovary. In many instances it was not possible to say that the cystic ovaries contributed to the symptom-complex because of the presence of more serious lesions.

After the removal of all existing lesions, and relief from all symptoms obtained, it is not always possible to say to what extent the resection or removal of the ovaries contributed to the recovery. For example, cystic degeneration of the ovaries associated with salpingitis

and retroversion of the uterus with adhesions, might give rise to backache, sterility, and dysmenorrhea, and contribute to general nervous phenomena; but it is manifestly impossible to determine to what extent the ovaries contributed to the suffering and disability. However, it may be expected that anatomical and clinical studies of a large number of these cases would yield some valuable suggestions, and especially so when compared with similar studies of uncomplicated cases.

Fig. 341



Follicular degeneration of the ovary. The ovary contains one large follicular cyst and numerous small ones. The stroma is increased and prevents the rupture of the cysts. Near the outer border of the ovary is an old corpus luteum. The cysts contain a clear serous fluid.

In reviewing the opinions of the observers who have written upon the subject, including Virchow, Gebhard, Abel, Kolb, Ziegler, Ruge, Pfannenstiel, Amann, Martin, and Frakle, I find it to be the consensus of opinion that follicular degeneration is the result of chronic ovaritis; that these follicles do not arise from cell inclusions, as stated by Nagel, but are the direct result of passive congestion and hyperplasia of the stroma.

As a suggestion of the pathological nature of follicular cysts, Martin observes that they are not confined to the outer zone of the ovary, as is the case with ripened follicles, but, on the contrary, are distributed throughout the stroma. This he regards as of greater significance than the number and size of the follicles. Martin does not attempt to fix the normal limits in size for a follicle, but says they are manifestly pathological when they approach the ovary in size, whether they contain ova or not.

Ziegler described a follicular cyst the size of a man's head, and Martin reports one which weighed seventeen pounds.

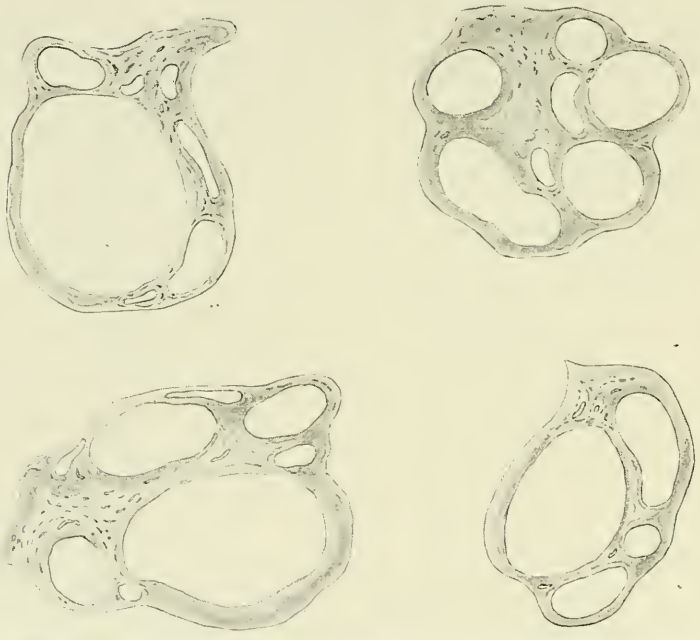
In the 180 cases of cystic degeneration of the ovaries in which complete or partial removal of one or both ovaries was done the following

anatomical conditions were noted: the cysts varied in size from a pea to an Eng'ish walnut, and in number from one to a score or more.

Reference to the diagrams in Fig. 342 shows that these cysts, as Martin has pointed out, are not confined to the periphery of the ovary, as is the case with ripened follicles, but are distributed throughout the stroma and may almost replace the stroma.

On microscopic examination of these ovaries I have been astonished to note the scarcity of normal follicles which contained ova. In a few sections none was to be found, and in nearly all they were fewer in number than would appear normal. The explanation probably

FIG. 342



Follicular degeneration of the ovary. The diagrams illustrate the distribution of the follicular cysts throughout the stroma of the ovary. Almost the entire ovary is replaced by the cysts.

lies in the atresia brought about by the addition of new connective tissue to the stroma and its subsequent contraction. In a small percentage of cases fresh corpora lutea were found, showing the ovary capable of functionating. In all of them corpora albicantes were abundant.

Hyaline degeneration is a prominent feature in nearly all sections. The walls of bloodvessels, corpora albicantes, stroma, and tunica albuginea all possess more or less of a hyaline deposit. This is marked even in the ovaries of young individuals. Congestion of the bloodvessels, while not constant, was a notable feature in almost all cases. Round-cell infiltration of the stroma was frequently observed.

Gland-like structures, the remains of Gärtner's ducts, were occasionally found in the hilus of the ovary. In the follicles, not exceeding a pea in size, the membrana granulosa and ovum were usually found, and when present the ovum was never in a healthy state. In the larger cysts the author has carefully searched for lutein cells in the walls, but has repeatedly failed, and in many there was a trace of membrana granulosa and theca. Cysts the size of a walnut were undoubtedly follicular, though a larger number were from corpora lutea.

A review of the clinical history of these 180 cases includes the records of the pathological findings at the time the operation was made, with a view of determining to what extent these morbid changes in the ovary contributed to the suffering of the patient, and for the purpose of determining if possible the clinical importance of the lesion.

Of the 180 cases, 39 were uncomplicated by pelvic lesions other than follicular degeneration of the ovaries. A clinical study of these uncomplicated cases should afford some definite conclusions. In the remaining 141 cases in which there were complicating pelvic lesions, it has been possible, to a certain extent, to note the role played by the cystic ovaries, but this was only attempted after a careful analysis of the uncomplicated cases.

In the 39 uncomplicated cases general pelvic pains were complained of in 16; pain in the region of the left ovary in 11; pain in the region of the right ovary in 10, and pain in the back in 19 cases. It was a rule, to which there were a number of exceptions, that the pain was referred to the affected ovary. When both ovaries were involved, the pain was likely to be distributed throughout the pelvis, and when one or both ovaries were cystic and lay behind the uterus, there was usually backache. In each case pelvic pain was complained of. Tenderness was almost always elicited by pressure upon the affected ovaries. In 18 of the 39 cases there was dysmenorrhea, and in the most of these cases the pain preceded the appearance of the menstrual flow and continued throughout the period.

In 34 cases the flow was normal or decreased in amount; in 5 cases there was menorrhagia; 6 of the cases were sterile; 6 were married, and the remaining 27 had borne from one to nine children. In 3 cases it is recorded that the patient was hysterical, and in 11 cases general nervous disturbances were complained of. Headache was present in 15 cases.

In reviewing the histories of the 141 complicated cases, the author has satisfied himself in many instances that the cystic ovaries contributed in the above manner to the discomfort of the individual.

Varicose ovarian veins in the broad ligaments are doubtless a more common factor in the causation of cystic degeneration of the ovaries than would be inferred from these statistics. Doubtless they were not always recorded when found, and the Trendelenburg position would empty the veins and make them less prominent. The passive congestion in the ovaries as the direct result of varicosities in the ovarian veins would lead in time to hydrops of the follicles, and the

hyperplasia of the stroma would hinder the rupture of the enlarged follicles.

The average age of the cases when operated was thirty-two years. The youngest was nineteen years and the oldest forty-eight years. The greatest number were operated on between thirty and forty years of age, but there was an almost equal number between twenty and thirty years. The usual infectious diseases of childhood were experienced in 65 per cent. of the 180 cases; and there was a history of puerperal, postabortive, or gonorrheal infection in 63 per cent. The average duration of the symptoms was seven years. These observations have led me to the following conclusions:

Fig. 343

Follicular cyst of the ovary. (Hertzler.)

1. Cystic degeneration of the ovaries is almost invariably the result of chronic ovaritis, which in turn is caused by infection or passive congestion of the ovary. It is, therefore, a morbid lesion.

2. One or more ripened follicles in the ovary are not to be mistaken for follicular degeneration.

3. Symptoms referable to cystic degeneration of the ovaries are pelvic pain and tenderness, dysmenorrhea, sterility, and general nervous phenomena. Of these symptoms, pain is of constant occurrence, but is not constant in character or location. Too much stress is not to be laid upon the complaint of pain and tenderness, for undoubtedly the explanation frequently lies in the presence of associated lesions or in an instability of the general nervous system.

4. Cystic degeneration of the ovaries doubtless contributes to a general nervous state, but in my judgment this can only be due to the local discomfort. I doubt if there can exist a general disturbance of the nervous system referable to the ovaries without local discomfort.

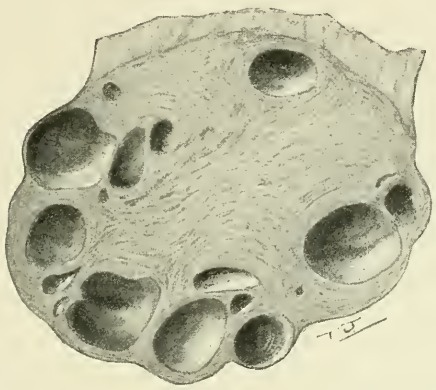
Therefore, in the absence of local disorders, the general nervous phenomena should not call for surgical intervention or for any interference with the ovaries.

Abscess of the Ovary.—There are acute and chronic abscesses of the ovary.

1. *Acute Abscess of the Ovary.*—Acute abscess of the ovary is seldom recognized in a clinical examination. Such abscesses commonly arise in the course of acute general septic infections with a speedy fatal termination. Hence it is that acute abscesses of the ovary are generally discovered in a postmortem examination.

2. *Chronic Abscess of the Ovary.*—Menge, in 33 cases of ovarian abscesses, found the gonococcus in 9, the colon bacillus in 4, the streptococcus in 1, saprophytic anaërobic microörganisms in 1, and in 18 the pus was found sterile. Martin found the pus sterile in 20 out of 55 cases.

FIG. 344



Follicular cyst of the ovary. Cross-section. (Hertzler,)

Anatomical Diagnosis.—As in hematoma, so in abscess of the ovary, there are three localities in which they may develop—the interstitial spaces, the follicles, and the corpus luteum.

Interstitial abscesses are found in all portions of the ovary. They are usually multiple and irregular in outline. The wall of the abscess is composed of connective tissue infiltrated with small round cells.

Follicular abscesses usually present a smooth wall of connective tissue. They may be single or multiple, and may attain the size of a man's head.

Corpus luteum abscesses are recognized by the corrugated inner lining of the cyst wall. The abscess lies superficially and is usually single. The blood coagulum in the centre of a corpus luteum is a favorable nidus for pyogenic microörganisms. This, with the superficial position of the corpus luteum and its intimate connection with an infected tube, makes infection easily possible.

Tuboövarian abscess, by which is understood a pyosalpinx directly communicating with an ovarian abscess, may be primary or secondary.

A primary tuboövarian abscess begins as a pyosalpinx and an ovarian abscess, and later communicates and forms one continuous abscess cavity. A secondary tuboövarian abscess arises from a secondary infection of a primary tuboövarian cyst. In 110 cases of ovarian abscesses Martin found a tuboövarian abscess in 18.

Clinical Diagnosis of Ovaritis.—The clinical picture is a variable one. The ovary is seldom involved alone, hence the clinical picture of ovaritis is rarely observed independent of complicating inflammatory lesions.

Acute ovaritis causes a rise of temperature and increase in the pulse-rate. There is exquisite tenderness on pressure over the ovary, so much so that an anesthetic is required in palpating it. For practical purposes a diagnosis of acute inflammation of the adnexa is sufficient. When the acute stage of the inflammation has subsided, the ovary can be outlined by a bimanual examination.

In *chronic ovaritis* there is no elevation in temperature. Pain in the region of the affected ovary, radiating to the groin and thigh, is the most constant symptom. Occasionally the pain recurs at regular intervals between the menstrual periods ("Mittelschmertz"). The explanation of this phenomenon is the ripening and bursting of the follicles through the resisting stroma and tunica albuginea. Individuals show a marked difference in their susceptibility to pain.

Chronic ovaritis may exist to a marked degree without causing pain, while, on the other hand, a slight involvement of the ovary may cause intense suffering. The pain is aggravated during the period of premenstrual and menstrual congestion. The pain of chronic ovaritis is often but the expression of a general nerve storm, and it is often difficult, indeed, to determine just how much the lesion in the ovary has to do with the pain.

In the early stage of chronic ovaritis the menses are increased, but, as the true ovarian tissue gives place to connective tissue, the menses become more and more scanty. Sterility is a common complaint, and is the immediate result of such complicating lesions as salpingitis and endometritis more often than of ovaritis. When the cause of sterility rests in the ovary, the explanation lies in the destruction of the ova and in the failure of the follicles to rupture through the thickened stroma, tunica albuginea, and surrounding adhesions.

When suppuration of an ovary follows upon ovaritis the symptoms are all aggravated. In acute abscess of the ovary the symptoms are all masked by the complicating peritonitis, metritis, and salpingitis.

Increase in the pulse-rate and elevation of temperature are to be expected in acute abscesses, but are often wanting in the chronic stage.

In determining the cause of the infection it is important to consider the clinical history, as a possible childbirth, abortion, or gonorrheal infection may play a part.

Physical examination of the pelvic viscera and of the leucorrheal discharge may reveal a gonorrheal or tuberculous infection of other portions of the genital tract.

PLATE XXIV

Tuboövarian Abscess. (Watkins.)

Exact size. The tube curves over the tumor and is seven inches long.

The diagnosis is made in part by a consideration of the above symptoms, but an absolute diagnosis cannot be made without a physical examination, and is often reserved until an exploratory incision offers further light.

Tenderness and pain may be complained of in the presence of a perfectly normal ovary, and chronic ovaritis may exist without causing pain or tenderness on pressure.

Direct palpation of the ovary in a bimanual examination under anesthesia is indispensable in making a diagnosis. The slight increase in size and consistency of the diseased ovary, together with evidence of infection elsewhere in the genital tract, will best suggest the diagnosis.

The diagnosis cannot be based upon the increase in size in the absence of pain and tenderness. Hypertrophy and cystic degeneration of the ovary will cause a similar increase in the size.

Abscess of the ovary cannot be diagnosticated from constitutional symptoms. Chills, fever, rapid pulse, and pain may all be absent in the presence of an ovarian abscess.

The diagnosis is based upon the finding of a rounded swelling beside or behind the uterus, and not immediately connected with it. The tube may be traced from the swelling to the horn of the uterus. The ovary is tender to pressure, and is always restricted in its movements by adhesions. Fluctuation is not often elicited.

It is sometimes possible to judge of the liability of the abscess to rupture by the degree of tension associated with the pain. At such a time the temperature and pulse are usually elevated, and there are increasing pressure symptoms referred to the rectum and bladder, and along the sacral nerves to the thighs and back.

On rupture of the abscess the temperature may fall and the pain cease. If the abscess has ruptured through the vagina, rectum, bladder, or abdominal wall, there will be an escape of pus, which is usually fetid and mixed with blood. If the abscess ruptures into the peritoneal cavity and the pus is confined by adhesions, there will be a moderation in the temperature and pain. If no adhesions protect the peritoneum, symptoms of general suppurative peritonitis will rapidly follow. Return of the abscess in the ovary is of common occurrence. Fistulæ and chronic suppuration are possible results which sometimes demand the removal of the sac long after a spontaneous rupture.

Differential Diagnosis.—*Congestion of the ovary* may be mistaken for an inflammation. The history of the development of the lesion and the duration and intensity of the disturbance are the guides to a diagnosis. No sharp line can be drawn between these lesions, even by anatomical studies of removed ovaries, and hence it is impossible to clearly define the two conditions.

Salpingitis is often associated with ovaritis, and the two may be inseparably connected, so that it is impossible to distinguish the ovary from the tube in a bimanual examination. Adhesions binding the tube and ovary may unite them into a single rounded or oblong tumor mass.

In general it may be said that inflammatory swellings of the tube are elongated, retort-shaped, and immediately connected with the horn of the uterus, while inflammatory swellings of the ovary are round and not so intimately connected with the uterus.

Parametric exudates lie at a lower level in the pelvis than does an ovarian abscess. The swelling is more diffuse and is absolutely immovable. Furthermore, a parametric exudate is intimately connected with the uterus, and is more often unilateral than are ovarian abscesses. An ovarian abscess is slower in its development and absorption than is a parametric exudate.

Perityphlitis is usually not difficult to distinguish from inflammatory lesions of the ovary. The higher location on the right side and the accompanying disturbances of the digestive organs will usually serve to exclude the ovary. The diagnosis will be made with certainty by outlining the ovary apart from the perityphlitic exudate.

Newgrowths of the ovary, including ovarian cysts, are less tender to pressure, the pain is rarely so fixed, and the outline of the tumor is often quite irregular. Finally, their tendency to grow to a large size will serve as points of distinction.

The *echinococcus* has been identified in the ovary by Freund, Schultze, Schatz, Orth, and Pfannenstiel. The diagnosis can only be made by the discovery of the organism in the ovary.

Treatment.—The conservative management of ovaritis in the acute and chronic stages does not differ essentially from that of salpingitis. For the non-operative methods of treatment the reader is referred to page 467.

CHAPTER XXI

PERITONITIS

General Peritonitis
Non-septic, Traumatic
Septic
Postoperative
Puerperal
Gonorrheal
Tuberculous
Pelvic Peritonitis

GENERAL PERITONITIS

There are two distinct forms of peritonitis, the non-septic or traumatic, the result of injury to the peritoneum, and the septic, in which infectious microörganisms are the essential factors. In addition to these two chief varieties we will refer, under separate headings, to tuberculous and cancerous forms.

Non-septic or Traumatic Peritonitis.—Non-septic or traumatic peritonitis may be said to develop to a greater or lesser degree in every abdominal section in which the peritoneum is exposed. It is particularly marked when the peritoneum is stripped from adherent inflammatory growths or new-formations.

In retroflexion of the uterus, in prolapsed ovaries, and in pelvic and abdominal tumors there are not infrequently encountered adhesions which are the result of mechanical irritation of the peritoneum.

Postoperative adhesions, binding peritoneal surfaces together, are the result of exposure of the peritoneum to the drying influences of the air, and of rough handling by the operator.

Clinical Manifestations.—Marked clinical symptoms can only develop when extensive surfaces are involved. When extensive peritoneal surfaces are denuded of their endothelial covering in the process of an operation, the patient will usually complain of some local tenderness and pain, of a slight rise in temperature, and possibly of some degree of constipation. When the area involved is great there may be all the clinical evidences of general peritonitis. The tympany, rigidity of the abdominal muscles, pain, tenderness, constipation, nausea, vomiting, and rise of temperature and pulse-rate, all suggest a general involvement of the peritoneum.

Prognosis.—The prognosis is good unless ileus should develop. Extensive adhesions are known to absorb, but, as a rule, they persist and continue to give rise to local pain and tenderness and to disturbed functions of the involved organs.

Treatment.—*Prophylaxis* is of prime importance. In all abdominal operations the utmost care should be exercised to prevent undue exposure of the peritoneum, both to the air and to handling. To

accomplish this the intestines should be carefully walled off from the field of operation by gauze packs wrung out in hot sterile normal salt solution.

All raw surfaces should be carefully covered with peritoneum, but when this is impossible, subsequent adhesions may be prevented by lightly charring the denuded surface with the actual Paquelin cautery at a dull glow.

In this connection the author favors the practice of Dr. Frank Simpson, of Pittsburg, who applies an ice-bag to the abdomen as a preventive measure. Gellhorn extols the application of dry heat to the abdomen as a preventive measure to the formation of adhesions. (See page 210.)

Septic Peritonitis.—Contrary to the previously accepted views the peritoneum is not readily infected as compared with other tissues; this fact is well established both clinically and experimentally.

Infectious microörganisms are the essential factors in the development of septic peritonitis, but many predisposing factors are operative in rendering the peritoneum susceptible to infection.

Predisposing Causes.—Whatever lowers the resistance of the peritoneum will render it more liable to infection; in this category should be placed the long exposure of peritoneal surfaces to the air, rough handling, and the breaking up of adhesions.

Again, the general lowered resistance of the individual may be regarded as a predisposing factor. Kelly says: "The pathological and bacteriological study of all the cases of peritonitis which have come to autopsy in the Johns Hopkins Hospital has clearly demonstrated the greater liability to the invasion of bacteria on the part of persons subject to chronic diseases of one or several of the important viscera."

The leaving of foreign bodies in the abdominal cavity, such as sponges and instruments, is sometimes responsible for the development of septic peritonitis. Other foreign bodies may produce a generalized or localized septic peritonitis, *i. e.*, wandering fibroids, the escaped fetus in a ruptured ectopic pregnancy, the escaped fluid from a ruptured cyst or Fallopian tube, and the accumulation of blood following a pelvic or abdominal operation.

Essential Causes.—Referring to the essential causes of septic peritonitis, we have to consider the source of the invading microörganisms, their number, and above all their virulence.

We have frequently observed pus escape into the free abdominal cavity without producing peritonitis; such pus is sterile, or at most the contained microörganisms are of low virulence.

Furthermore, there is wide variation in the absorbing power of the various parts of the peritoneum; the pelvic peritoneum has a relatively low power of absorption, and hence is less susceptible to infection and to the spread of the infection to the upper regions of the abdomen.

Of the ordinary bacteria causing peritonitis, by far the most virulent

and destructive is the streptococcus pyogenes; the resulting inflammatory involvement is rarely circumscribed, but spreads rapidly to adjacent and remote parts of the peritoneum.

The staphylococcus aureus usually has a lower degree of virulence, and the resulting inflammatory reaction is commonly localized; and when involving all or the greater part of the peritoneum, the prognosis is not so grave as in a streptococcic infection.

Other microörganisms which invade the peritoneum and cause a general inflammatory reaction are the gonococcus, colon bacillus, tubercle bacillus, bacillus proteus, bacillus pyocyaneous, bacillus typhosus, and micrococcus lanceolatus.

Anatomy.—The inflammatory reaction in the peritoneum is not always proportionate to the degree of general intoxication. Indeed, the most virulent infections may result fatally before there is time for an inflammatory reaction to develop in the peritoneum, beyond that of a moderate congestion and a limited amount of serofibrinous exudate. The greater the virulence, the less the exudate. In such cases a microscopic examination of the peritoneum will generally reveal innumerable streptococci.

The pathological findings in acute peritonitis depend upon the nature and intensity of the infection. There may be no more than a loss of luster and a slight deposit of fibrin upon the peritoneum when the infecting microörganisms are of low virulence. In the development of an acute inflammation of the peritoneum there is first a reddening of the bowel, followed by a loss of luster and agglutination of the coils of bowel by a deposit of yellowish-white fibrin flakes. Peritoneal fluid usually accumulates early in the process. This fluid is turbid and contains soft pultaceous masses and flakes. Soon the fluid becomes purulent. Later in the process this exudate becomes encapsulated between coils of bowel, and is thick and creamy. The fibrinous exudate becomes firmly organized into adhesions.

The chronic stage may develop insidiously or may be the terminal stage of an acute inflammation. Chronic peritonitis may be divided into (1) chronic exudative peritonitis, in which there is a serous, serofibrinous, or fibrinopurulent exudate, with more or less of a plastic exudate; (2) chronic exudative and adhesive peritonitis, in which there is a preponderance of plastic exudate leading to the formation of adhesions; (3) chronic hyperplastic peritonitis, with the formation of plaques or sheets of hyaline material of a whitish, cartilaginous character, together with a fibrinous exudate.

Clinical Manifestations.—It is not easy to recognize a general peritonitis in its early stage, at a time when there is the greatest prospect of cure.

In postoperative septic peritonitis the facial expression of the patient is suggestive. She appears anxious and careworn, and as the end approaches, cyanosis develops and the extremities become cold and clammy. Little dependence can be placed upon the temperature. There is usually some elevation of temperature in the beginning, but

later it may be normal or subnormal. The pulse is a reliable guide and a good indication of the progress of the disease. It is increasingly rapid, becoming weaker and more rapid as the disease advances. The patient lies with both legs flexed. Vomiting and hiccough become more and more persistent. The vomitus is not great, and is usually black from the presence of digested blood. Abdominal pain is at first intense, but as the end approaches and the patient becomes profoundly toxic, the pain recedes and the patient may express herself as being quite comfortable; this is an unfavorable sign. All the secretions are scanty. The skin is dry until near the end, when it is covered with cold sweat, and the tongue is dry and coated. The abdominal distention and muscular rigidity increase, and, as a rule, the bowels fail to move, though diarrhea is an occasional accompaniment.

Prognosis.—The outlook is always grave in septic peritonitis, but modern methods of treatment have done much to reduce the mortality.

The pulse is a better guide to the prognosis than the temperature. The number of leucocytes in the blood is likewise of prognostic value when correctly interpreted; an increasing leucocytosis in the course of a septic peritonitis indicates increasing tissue resistance on the part of the patient, and hence the value of making repeated blood-counts during the course of the disease.

When terminating fatally the course will usually be run in from three to five days, but death may ensue within twenty-four hours, or as late as the fourteenth day.

Treatment of General Septic Peritonitis.—In the early years of modern surgery the choice was always in favor of extraperitoneal operations as opposed to intraperitoneal procedures in view of the great liability of infection of the peritoneum; but of late years surgical technic has become so perfected that the paramount question is, How can the best results be obtained irrespective of the chances of infection?

Prophylaxis.—The utmost confidence is imposed in our methods of safeguarding the peritoneum from invasion by septic germs. One of the most important considerations in the prevention of general septic peritonitis is involved in the management of cases of acute pelvic infection. *The abdomen should never be opened in the presence of a circumscribed, acute pelvic inflammation, and all recent accumulations of pus in the pelvis should be drained through the vagina.* The question as to how soon after an acute attack of pelvic infection it is safe to enter the abdominal cavity for the removal of offending organs is difficult to answer. The acute pain and tenderness, the temperature and rise of pulse-rate, and the leucocytosis must not only have passed away, but some time should intervene in order that the microörganisms may lose their virulence for want of an environment favorable to their growth and activity. It is the author's practice to postpone all surgical interference by way of the abdomen for a period of not less than three months, and in the meantime to endeavor to allay the inflammatory reaction by rest, hot vaginal douches, and glycerin and ichthyol tampons. (See Chapters X and XI.)

If the operator should be misled into the abdominal cavity by the lack of local evidence of an acute pelvic inflammation, and the want of a reliable history, and upon inspection of the pelvic contents through the abdominal incision he is confronted with the presence of an acute inflammatory reaction in the tissues lying outside the uterus, it would be a commendable procedure for him to close the abdominal incision without further interference. This should be done not only to protect the peritoneal cavity from possible contamination, but also to conserve tissues which might be saved by tentative measures. Not infrequently the surgeon will find that there will be no occasion for opening the abdomen at a later date because of the relief from all disturbing symptoms and the apparent restoration of the tissues to the normal by the employment of conservative measures.

If in an abdominal operation the gloves of the operator or assistants become soiled by infected material or are torn, they should be immediately changed, and all soiled sponges, pads, and towels should also be discarded.

Careful hemostasis and the covering of all raw surfaces with peritoneum are important factors in the prevention of abdominal infections.

Rough handling and unnecessary prolonged exposure of the peritoneum predispose to peritonitis by lowering the resistance of the tissues and by affording greater opportunity for the invasion of microörganisms.

No peritoneal surface should be left exposed in an operation for a longer time than is absolutely required for the carrying out of the operation; gauze pads should be used liberally in the covering of all intra-abdominal organs which are not under immediate inspection.

Much can be done in the way of preventing the upward spread of a pelvic inflammation by placing the patient in the Fowler position. This should be done during the course of an acute pelvic inflammatory attack both before and after operation, and in all cases of acute or chronic pelvic inflammation operated through the vagina or abdomen.

Active Treatment.—Knott[1] reported 19 cases of general septic peritonitis with 17 recoveries; 4 of this number were gynecological cases. Knott makes a liberal incision in the median line. A long drainage-tube is inserted through the lower end of the abdominal incision and is carried to the floor of the pelvis. Vaginal counter-drainage is made through the cul-de-sac, using a rubber tube. The whole abdominal cavity is washed out with gallons of sterile normal salt solution. The abdominal incision is closed with stitches close to the drainage-tube and quantities of sterile dressings are applied. The patient is then elevated to a sitting posture, being supported from behind by pillows. The head of the bed is elevated twenty-four to thirty inches from the floor. The dressings should be changed frequently.

The question of confining the bowels with opiates as opposed to free catharsis is still somewhat under discussion. The author is in accord with the general practice of opening the bowels at the earliest possible

[1] Annals of Surgery, July, 1905.

moment, and of keeping them open, if possible, throughout the entire course of the infection. To accomplish this, $\frac{1}{4}$ grain of calomel may be given every hour, together with a dram of Epsom salts, followed by enemata consisting of Epsom salts, 2 ounces; glycerin, 2 ounces; sweet oil, 4 ounces. When there is much gas a few drops of turpentine may be added.

An effective enema is a pint each of warm molasses and milk; it has a soothing effect, and often accomplishes the expulsion of gas and the unloading of the bowel of fecal matter when other means fail.

The author has also found satisfaction in the injection into the bowel of a pint of normal salt solution with 2 ounces of alum.

Persistent vomiting may preclude the administration of cathartics by the mouth, and if so, the only resort is rectal injections, preceded by a hypodermic injection of $\frac{1}{40}$ grain of physostigmin.

All efforts to move the bowels may fail, and death ensue within five days of the onset of the peritonitis.

When the pain cannot be controlled by the application of heat or cold to the abdomen, hypodermic injections of morphine must be resorted to, but these must be used sparingly.

No antipyretics, other than cold sponging, should be used because of their depressing effects.

The strength of the patient should be maintained by nutrient enemata if the stomach will not retain food. When neither the bowel nor stomach will retain nourishment, the outlook is exceedingly grave.

Nourishment by the mouth is withheld until vomiting has ceased.

Stimulation may be resorted to by hypodermoclysis of normal salt solution, also by the hypodermic injection of strychnine, gr. $\frac{1}{60}$ to $\frac{1}{30}$, every two to six hours, and whisky, in 1 to 4 dram doses, given by mouth, bowel, or hypodermically.

Operative Treatment.—There is no more difficult problem to solve than the question of when to interfere surgically in the course of septic peritonitis. The most favorable time for surgical intervention is at the very onset of the peritonitis, but the difficulty arises in the making of the diagnosis of peritonitis in its initial stage before it has involved any considerable portion of the peritoneum. So many conditions, such as gas distention, ileus, hemorrhage, and auto-intoxication, having no relation to peritonitis, may closely simulate peritonitis in its early stages, and hence one naturally hesitates to interfere surgically until the clinical evidences are well-marked. Furthermore, the case may be seen at a time when it is believed that any operative procedure will hasten the fatal issue, yet such cases are occasionally saved by free drainage; hence, the surgeon can never be assured as to the proper procedure. The result is that he is impelled to take the chance of operating, though the chance may be ever so small.

General septic peritonitis has at times been known to recover without surgical intervention, but the event should never be anticipated.

All this confirms the statement that there is no more difficult problem in surgery than that involved in the surgical treatment of septic peri-

tonitis, both in its early and late stages. The late achievements in the treatment of septic peritonitis have brought us to the conclusion that in all cases, save those that are in a moribund state, the abdomen should be opened and freely drained; and in all cases when there is good reason to believe that peritonitis is beginning and is advancing, and in which conservative measures have been tried without avail, an exploratory incision should be made. The fact that many of the conditions which are confused with peritonitis justify an exploratory incision into the abdomen, gives added justification to surgical intervention in suspected cases.

After it has been determined to establish drainage the question arises, Shall the drainage be vaginal or abdominal?

It may be said that vaginal drainage offers the least risk, but it is an uncertain procedure because one can never be certain of thorough drainage. Whenever localized accumulations of pus are found in the pelvis they should be drained through the vagina. Having succeeded in establishing free drainage through the vagina, if improvement does not ensue, but, on the contrary, the evidences of general peritonitis progress, the abdomen must be opened for counter-drainage.

When no accumulation of pus is found in the pelvis, vaginal drainage alone is not indicated, and can only be considered as a secondary procedure to abdominal drainage.

When draining for postoperative peritonitis, the stitches in the lower portion of the wound should be removed and the gloved finger carefully inserted in the direction of the uterus and broad ligaments, in search of pockets of pus. The search is continued to the extent of satisfying one's self that all pockets of pus have been opened and free drainage established through the opening in the abdominal wall. In the search for the accumulated pus it may be necessary to explore the greater part of the abdominal cavity. Caution must be exercised in so doing for fear of contaminating portions of the peritoneum not involved in the infection; hence, the search should only extend to those portions of the peritoneum that are visibly involved.

The drainage should be free and lead to the most dependent portions of the infected zone. For this purpose the author uses one or more fenestrated rubber tubes, one-half inch in diameter. Two, three, or possibly four such tubes should be placed, one for each of the pus cavities found, and all are brought through the abdominal incision. If thought advisable, a second and even a third incision may be made through the abdominal wall in order to establish more efficient drainage.

When possible, drainage should be established through the vagina by making a transverse incision an inch in length through the posterior fornix. A gauze pack or rubber tube is passed from above through the incision into the vagina.

The greatest caution should be exercised in the application of sponges and swabs for fear of removing the protecting lymph and endothelium from the peritoneal surfaces. The same objection is open to irrigation of the abdominal cavity, which presents the additional danger of

spreading the infection throughout the peritoneal surface not as yet involved. For the above reason the author dispenses with both swabs and irrigation, and establishes free drainage only.

After the drainage-tubes are in place the wound is dressed with an abundance of sterile gauze and the patient placed in bed in the Fowler position.

A rectal tube is inserted high in the bowel, and through this normal salt solution is slowly injected at the rate of 15 drops per minute, and continued for twenty-four or more hours.

Puerperal Peritonitis.—Acute diffuse puerperal peritonitis is generally regarded as fatal unless operated. When the infection has invaded the blood-stream, drainage of the abdomen will be of no avail. If the blood is sterile, no time should be lost in establishing free drainage. Fortunately the blood is late in being invaded in these cases.

Treatment.—The treatment of acute diffuse puerperal peritonitis is most discouraging; this is in marked contrast to that of general peritonitis following appendicitis. In diffuse puerperal peritonitis there are microörganisms of high virulence and the resistance of the individual is commonly low; whereas in peritonitis following appendicitis the microörganisms are usually of lower virulence, and the resistance of the individual is usually high. Then, too, there is better opportunity to establish direct drainage of the primary focus of infection in appendicitis.

All will agree that early and free drainage of the peritoneal cavity is imperative. Of this there is no question, but the difficulty lies in the making of a diagnosis early enough to insure good results. When the infection has spread directly through the uterine wall to the peritoneum we encounter germs of high virulence, and drainage of the abdomen will rarely be successful. If, on the other hand, the infection invades the peritoneum by way of the tubes we meet germs (streptococci, staphylococci, gonococci) of lower virulence; hence, the results from drainage are better.

In general, the technic of abdominal drainage, of the continuous administration of salt solution by the bowel, and of the enforcement of Fowler's position does not differ from that practised in the management of peritonitis following appendicitis, and will not be discussed here in detail. It is, however, of great importance to consider the question of removing the primary focus of infection.

If an infected uterus has been perforated or lacerated it should be removed, provided the condition of the patient will permit. If it is evident that the patient cannot withstand so formidable an operation, a dam of gauze should be placed about the uterus to protect the general peritoneal cavity. When the infection has spread to the tubes their removal is advised if the condition of the patient will warrant. A ruptured pus-tube should be removed. There is some difference of opinion as to the advisability of flushing the abdominal cavity with salt solution, but the consensus of opinion is strongly opposed to the practice. When there is great distention of the bowel that cannot be

relieved by drainage of the peritoneal cavity, and by the usual means employed for the expulsion of gas, multiple punctures of the bowel may be made.

Fromme reported 12 cases operated on for acute diffuse puerperal peritonitis; 6 of this number were lymphatic invasions; all died. Only 2 of the 12 cases recovered. These experiences do not condemn the practice of draining the abdominal cavity, but serve to emphasize the necessity of an early diagnosis.

We have a suggestion in the practice of Latzki, who makes an exploratory abdominal incision early in suspected cases of peritonitis. Henkel advises an early exploration through the cul-de-sac and the taking of cultures from the peritoneum.

The prognosis depends much upon the nature of the infecting organism. If there is a gonococcus or a mixed colon infection the prognosis is relatively good; if there is a streptococcic infection the prognosis is bad.

Bumm drained 45 cases, with recovery in 48 per cent.; Wormser, 177 cases, with recovery in 37 per cent. Latzki operated 47 cases of puerperal peritonitis out of a total of 125. Of the 51 cases not subjected to operation only two recovered; of the 47 operated on, 17 (24 per cent.) recovered. He observes that none of the cases with great distention of the bowel recovered. If there is great distention of the bowel, which is not readily controlled by eserine, multiple punctures should be made into the bowel.

In the fulminating forms of peritonitis no good can ensue from surgical interference. In the less virulent forms early drainage is imperative. This demands an early diagnosis, and suggests the advisability of making exploratory punctures and incisions.

Gonorrheal Peritonitis.—Contrary to the views previously entertained, the gonococcus may invade the peritoneum and give rise to an inflammatory reaction. It is not essential, however, that the gonococcus be resident in the peritoneum, in the presence of an acute or chronic inflammatory lesion of the peritoneum associated with a gonorrheal metritis, salpingitis, and ovaritis.

It may be assumed that the peritoneum is involved in the acute stage of a gonorrheal infection when the pelvic pains are sharp and excessive.

It is possible that an acute pelvic peritonitis may resolve itself into a normal state, but when the appendages contain pus or when the infection is widespread and persistent, adhesions are almost sure to develop. These adhesions are at first frail, but may develop into strong bands which firmly unite the pelvic viscera to surrounding structures.

Accumulations of pus may be found in the meshes of the adhesions, with little danger of contaminating the general peritoneal cavity.

Diagnosis.—The severity of the pain and tenderness in the pelvis, the frequent exacerbations, the discomfort occasioned by the movements of the patient, the tendency to bloating at the menstrual periods, are all suggestions of the presence of pelvic peritonitis.

On bimanual examination the restricted movements of the uterus and its appendages, even to complete fixation, together with the unusual amount of pain occasioned by the manipulations of these organs, are highly suggestive of the presence of adhesions. If with these findings the organs are found displaced, the diagnosis is more nearly confirmed. It may be possible to feel adhesions by a bimanual examination; however, they commonly exist and are not infrequently extensive when it is impossible to feel them, and when the pelvic organs are but little restricted in their movements. It is never possible to diagnosticate the absence of adhesions without inspection or palpation through an incision.

General gonorrheal peritonitis is exceptionally rare. Bumm states that he has never seen a case. In his own experience the author has observed only one such case, but in this case his clinical and postmortem diagnosis was not confirmed by a bacteriological examination. Martin, Broese, Veit, Leopold, Penrose, Menge, and Ceppi have all reported cases. The majority of these cases, like that of the author's, were reported from clinical data.

Treatment.—The treatment of general gonorrheal peritonitis does not differ from that of other forms of general peritonitis.

Tuberculous Peritonitis.—Tuberculous peritonitis is now generally regarded as a surgical disease; this applies particularly to the ascitic variety, and more especially to the cases in which the primary focus can be removed. Much, however, can be done by medicinal means, and in selected cases only medicinal means need be employed to effect a cure.

Cases may be operated, not with the hope of curing the disease, but of removing causes of obstruction to the bowel and of pressure upon nerves and bloodvessels.

Tuberculous peritonitis in women is particularly amenable to surgery because of the frequency with which the disease is found to be primary in the Fallopian tubes. According to Osler, 30 to 40 per cent. are primary in the Fallopian tubes.

While it is true that the most favorable cases are those in which the lesion is confined to the peritoneum and the organs resident in the abdomen which are removable, *i. e.*, Fallopian tubes and appendix, it is generally conceded that mild pulmonary and lymphatic tuberculosis do not offer a contra-indication to an abdominal section. Such is the view of Pribram, Vierorett, Schwartz, and Israel.

The fibrous and ulcerative forms of peritonitis are not favorable to operation, and when a tuberculous enteritis exists, one should be slow to interfere surgically.

Treatment.—*Medical.*—The medical treatment of tuberculous peritonitis is that employed in the management of tuberculosis of the lungs. Good food and fresh air are absolutely essential. Such tonics as cod-liver oil, the hypophosphites, the syrup of the iodide of iron, and arsenic have their place, but do not in the least supersede fresh air and an abundance of nourishing food. No medicine should be given that will disturb the stomach and interfere with the ingestion of food.

. Tuberculin has been extolled, but it is not clear that its value is great as a curative agent. Cures by the administration of tuberculin have been reported by Gray, Rumpf, McCall, Leser, Kummel, and Riegel. von Ruck gives the most encouraging reports, having a record of three cures in four cases.

Surgical.—The surgical treatment of tuberculous peritonitis has generally consisted in making a median abdominal incision, in removing all fluid by means of swabs, and irrigating with sterile normal salt solution; in severing any adhesive bands which may obstruct the bowel, and finally, in removing the primary focus when possible. Unless pus is present drainage is not ordinarily employed. It is seldom that vaginal drainage is established.

It is well to remember that too much surgery in these cases is hazardous. Abdominal surgery has taught us much about the self-healing of peritoneal tuberculosis. Until these cases were operated the disease was regarded as uniformly fatal. Of late years it has been the experience of surgeons that, in a subsequent abdominal operation, a well-marked case of peritoneal tuberculosis seen in the first section is found partially or completely healed in the second. The profession became overzealous in the surgical treatment of tuberculosis of the peritoneum because of the encouraging reports which came from the many clinics. In later years it was found that many of these cases remained apparently well for one or more years and then developed evidences of recurrence. Because of the great number of such recurrences the tendency of late years is toward conservatism.

It is now believed that a cure cannot be pronounced with certainty until the expiration of five years.

The combined statistics of 28 foreign and 9 American operators give a total of 1375 cases of peritoneal tuberculosis on which abdominal section was done. Of this number 1011 cures are reported, or a percentage of 75.5. Inasmuch as no time limit is placed on these cases we are to accept the report as altogether untrustworthy. For further discussion of the subject see page 544.

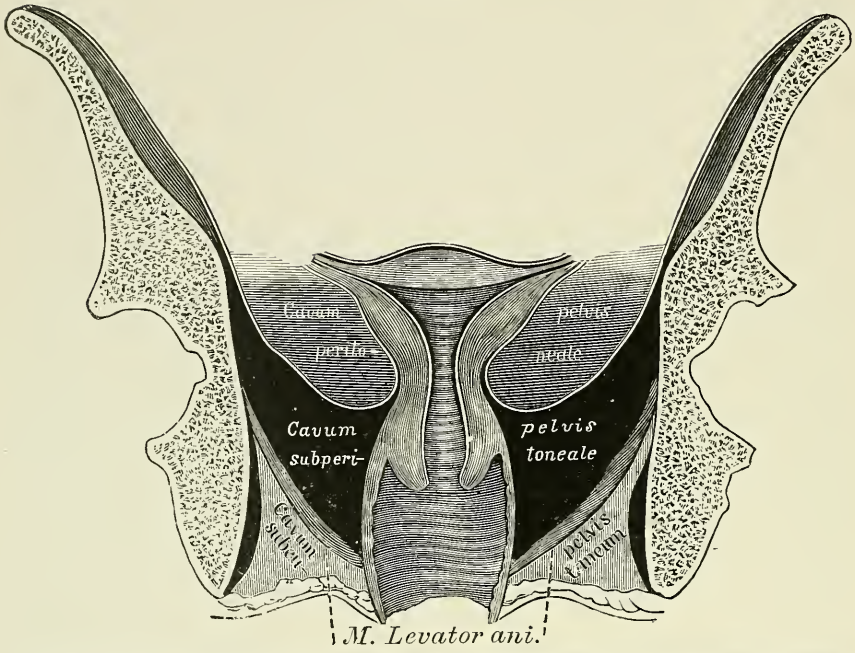
PELVIC PERITONITIS

Definition.—Part or all of the pelvic peritoneum is involved in the inflammatory process. We therefore speak of diffuse and localized pelvic peritonitis. When localized various terms are employed to designate the location and extent of the lesion. We speak of perimetritis when the peritoneal covering of the uterus is affected; of perisalpingitis and peri-ovaritis when the peritoneal coverings of the tube and ovary are involved.

Of greater clinical importance is the distinction between general abdominal and pelvic peritonitis and an isolated, well-defined, pelvic peritonitis. A pelvic peritonitis may be primary or secondary to a general abdominal peritonitis—a fact of considerable importance in its bearing upon the diagnosis and treatment.

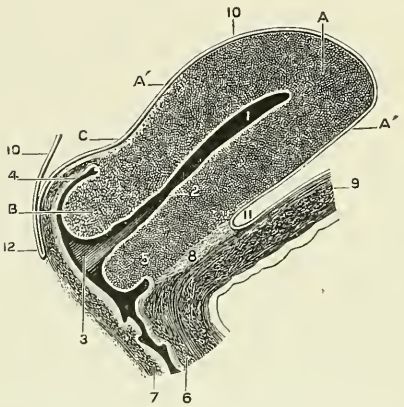
The infection is usually conveyed through the uterus and tubes to the peritoneum immediately surrounding these organs. A direct

FIG. 345



Three divisions of the pelvic cavity, namely, peritoneal, subperitoneal, and subcutaneous. (Fehling.)

FIG. 346



Sagittal section of the uterus to show the manner in which the peritoneum is attached. *A*, body of the uterus; *A'*, anterior surface; *A''*, posterior surface; *B*, neck; *C*, isthmus; 1, cavity of the body; 2, os internum; 3, os externum; 4, posterior fornix; 5, anterior lip of cervix; 6, anterior vaginal wall, 7, posterior vaginal wall; 8, vesico-uterine septum; 9, wall of the bladder; 10, peritoneum; 11, vesico-uterine pouch; 12, cul-de-sac of Douglas. (Testut.)

invasion from the uterus, tubes, rectum, appendix vermiformis, or bladder occurs with less frequency.

It is possible for infection to be conveyed along the mucosa of the uterus and tubes to the peritoneum without causing anatomical changes in the uterus and tubes, or such changes may be limited to portions of the mucosa.

Likewise, the lymphatic channels may be mere carriers of infection without themselves being involved. We are, therefore, not justified in concluding that infection has not passed by a given route because there are no anatomical evidences of such an event.

Etiology.—All that has been said of the etiology of endometritis will apply to pelvic peritonitis, inasmuch as the infection frequently first attacks the endometrium. Pelvic peritonitis has its starting-point less frequently in an infection of the bowel, bladder, vagina, or general peritoneum. Traumatisms of the perineum, cervix, and vagina, incident to parturition and surgical operations, may open the way for infection, which is conveyed by the bloodvessels and lymphatics to the peritoneum. The microörganisms chiefly found in the infected peritoneum are those common to endometritis, salpingitis, and ovaritis—that is, the staphylococcus pyogenes albus, aureus, and citreus, streptococcus pyogenes, gonococcus, colon bacillus, tubercle bacillus, Klebs-Loeffler bacillus, pneumococcus, and typhoid bacillus.

We will here discuss acute and chronic pelvic peritonitis, peritoneal exudates, and peritoneal adhesions.

Acute pelvic peritonitis shows a marked congestion of the bloodvessels or a diffuse blush of the peritoneal surface. Clinically, this stage is recognized by intense pain and tenderness in the pelvis, contraction of the abdominal muscles, tympany, vesical and rectal tenesmus, and painful menstruation. The temperature is elevated, and the pulse is accelerated in proportion to the degree of temperature and general intoxication. Vomiting and hiccoughing are often present in advanced cases, and the patient lies with both legs flexed upon the thighs.

All examinations and manipulations should be restricted as far as possible in the acute stage. It must be borne in mind that acute exacerbations of chronic peritonitis will give all the clinical evidence of a primary acute attack. Upon opening the abdomen, however, evidences will be found of previous involvement. Bandl says that high fever, great tenderness, and tympany in the pelvic regions are sure signs of pelvic peritonitis. It is only after the acute stage has subsided that a bimanual examination will make sure that the pelvic connective tissue is not diseased and that the peritoneum alone is affected. As a rule, the early symptoms must be relied upon in making the diagnosis, for in the majority of cases no palpable exudations are found.

Chronic pelvic peritonitis usually begins as an acute infection, but may be chronic from the beginning. Bandl says: "The lesion can be diagnosticated in girls and sterile women when, during the menstrual period or at any other time, with or without fever, there exist deep-

seated pain in the pelvis and more or less tenderness over the lower portion of the abdomen. If the symptoms are confined to one side, as is usually the case, the process is most probably present in the form of a perisalpingitis and perioöphoritis." In the opinion of the author, it is not possible to arrive at any intelligent conclusion from the above data as to the existence of chronic pelvic peritonitis. Too often mistakes are made by relying on the complaints of nervous and ignorant patients. A physical examination will alone serve to differentiate the many possible causes of such complaints as are found in the inflammatory lesions, the displacements, and the new-formations of the uterus and adnexæ. The anatomical evidences of chronic pelvic peritonitis are inflammatory exudates and adhesions.

Peritoneal exudates follow closely upon the initial acute stage. The exudate is serous, seropurulent, or purulent, and may be found to occupy part or all of the pelvic cavity. The most dependent portion of the peritoneal cavity is the cul-de-sac of Douglas, and into it the peritoneal exudate naturally gravitates. It is possible for such an exudate to cause a bulging of the posterior vaginal fornix, though this is not the rule unless the underlying cellular tissue is involved. In a vaginal examination an exudate in the pouch of Douglas is found to be sharply outlined, rounded below, and flat on the top. When too abundant to be wholly contained within the cul-de-sac, the exudate spreads out upon the posterior surface of the uterus, may extend laterally, and has been known to fill the entire inlet of the pelvis. The adherent and oftentimes distended intestine gives an indefinite outline to the upper border of the exudate.

The consistency of the exudate is variable. Fluctuation may be marked, or the exudate may appear firm, by virtue of the surrounding inflammatory infiltration.

In exceptional cases the exudate is located at the side or in front of the uterus. It is difficult to palpate through the vagina because of its high location. Without anesthesia there is an indefinite sense of resistance at the seat of the exudate. Under anesthesia the inflammatory mass may be fairly outlined. When a fluid exudate is encapsulated by adhesions, "adhesion cysts," it is possible to mistake it for a sactosalpinx or an ovarian cyst.

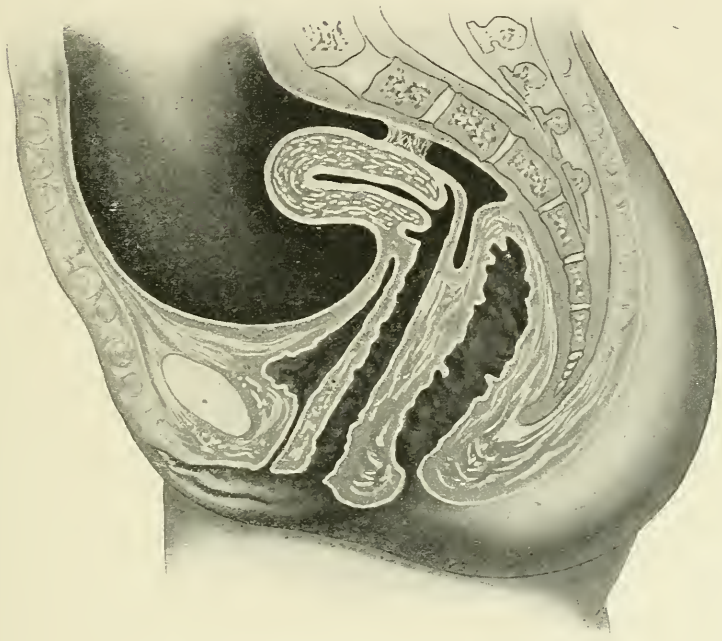
Peritoneal adhesions may follow a serous or purulent exudate, or may develop independent of a fluid exudate. The adhesions may involve any part or all of the pelvic peritoneum. They manifest great variations in development, from a delicate fibrillar structure to dense bands. They are more frequently found about the adnexæ and behind the uterus than in front of the uterus, for the reason that the infection commonly travels through the tubes to the peritoneum, and it is unusual for the tubes to lie in front of the uterus.

Gonorrhea is the most common cause of adhesions, and next in point of frequency is the infection following labor and abortion. As a result of the adhesions the uterus and adnexæ are more or less fixed, and their position is altered by contraction of the adhesions. With the exception

of prolapsus and inversion of the uterus, all varieties of malpositions are caused by adhesions about the uterus and its appendages.

Clinical Diagnosis.—The clinical diagnosis rests upon the physical findings. In a conjoined examination the adhesions are recognized as cords and bands, rarely as a diffuse thickening surrounding the viscera of the pelvis and uniting their peritoneal surfaces.

FIG. 347



Peritoneal adhesions bind the uterus in retroposition.

The abnormal fixity of the organs and their displacements are suggestive of the presence of adhesions. Not infrequently such fixity and displacements are recognized in an examination without anesthesia, and it is presumed that adhesions exist, though they are not accurately demonstrated without the administration of an anesthetic.

When displacements of the uterus and adnexæ, which have a restricted range of motion, are associated with tenderness and an indefinite sense of resistance at the side of or behind the uterus, an anesthetic should be administered to determine the possible presence of adhesions and exudates.

Differential Diagnosis.—It is at times extremely difficult to differentiate a pelvic peritonitis from a *hyperesthesia peritonii* found in women of nervous temperament. The general nervous state of the individual, the absence of all causes of infection, and finally a

conjoined examination under anesthesia, will serve to establish the diagnosis.

A retroflexed gravid uterus may be confounded with a peritonitic exudate. The fact of pregnancy should be determined by the usual signs. In the first trimester the cessation of menstruation and nausea are occasionally simulated by like complaints due to the inflammatory lesions about the uterus, in the absence of pregnancy. Such exudates are most often found in multiparæ in whom the changes in the breast are not usually well-marked during the early months of pregnancy. Of greatest importance are the changes in size, form, consistency, and the rate of growth of the uterus. An effort to replace the uterus, with or without anesthesia, will determine the presence or absence of adhesions.

In exceptional cases a uterus fixed by adhesions cannot be distinguished from an incarcerated uterus without an exploratory incision. This is particularly true when adhesions bind the uterus loosely to such movable structures as the bowel, omentum, and bladder.

When the uterus is fixed and tender to pressure, adhesions are suspected, even though they cannot be felt under anesthesia.

A retro-uterine hematocele may organize into peritoneal adhesions in the absence of infection. The history and physical evidences of an ectopic pregnancy, together with the usual signs of a hematoma and the absence of a history of infection, will serve to differentiate this condition from true inflammatory peritonitic adhesions.

Tuberculous peritonitis, with encysted fluid, according to H. Dure, is differentiated from an ovarian cyst by a family history of tuberculosis, by signs of the existence of other tuberculous lesions, by a history of frequent abortions or of the death of several children from tuberculosis; and by general symptoms of tuberculosis, such as loss of weight, strength, and appetite, evening rise of temperature, night sweats, pelvic pains, amenorrhea, leucorrhea, and the previous occurrence of salpingo-oöphoritis. The differential diagnosis of pelvic inflammatory exudates from sactosalpinx and ovarian cysts is referred to in the chapters on Diseases of the Tubes and Ovaries.

Treatment.—The tendency of pelvic peritonitis is to remain localized and not to spread to the peritoneum of the abdominal cavity. It is imperative that the surgeon should aid the forces of nature in limiting the infection, and should refrain from all surgical interference while the acute stage lasts, unless pus is present and can be drained per vaginam without endangering the general peritoneal cavity.

Absolute rest should be enforced throughout the acute stage, ice applied to the lower abdomen, and antiseptic douches (formalin, 1 to 2000, lysol or creolin, 0.5 per cent., or bichloride of mercury, 1 to 2000) given at a temperature of 110° and repeated every four to six hours, each douche being twenty to thirty minutes in duration. A light diet and daily evacuations of the bowels are essential. The temperature is combated by cold sponging.

When the acute stage has passed, the above treatment should be

pursued, and in addition, glycerin and ichthyol tampons should be inserted three or more times weekly. A detailed discussion of these treatments will be found in Chapter XI.

If an abscess develops in the pelvis during the acute or subacute stages and causes much pain and sepsis, the effort should be made to drain per vaginam. This procedure should be done cautiously for fear of contaminating the general peritoneal cavity.

As an argument against too hasty interference in surgery, we note the frequent observation of cases which have come to a functional cure, or have at least been so greatly improved by tentative measures and by the lapse of time, that conservative operations have substituted the more radical measures which were at one time contemplated.

In all cases of acute pelvic peritonitis the Fowler position should be maintained. When there is a high degree of septic absorption the patient should drink large quantities of water, and normal salt solution should be introduced per rectum. The continuous administering of salt solution, as advised by Murphy, is preferred. (See page 203.)

In the chronic stage of pelvic peritonitis the treatment is both tentative and surgical. There should be a judicious proportioning of the means at our command for the relief of the chronic stage of pelvic peritonitis. Surgery is invoked when tentative measures might suffice, and too often these measures are employed to the exclusion of surgery. A more common error is displayed in the failure to employ such conservative mean as rest, hot douches, and glycerin and ichthyol tampons, for an extended period after operation. Failure in so doing leads to incomplete cures in many instances.

In the treatment of chronic pelvic peritonitis the associated lesions should not be overlooked. The infected uterus, tubes, and ovaries must be attended to first, for they are responsible, in large part, for the manifest disturbances, and without their correction little can be done in the way of affording relief.

The conservative measures employed are pelvic massage, pressure therapy, prolonged hot vaginal douches, glycerin and ichthyol tampons, and sitz baths. (For a detailed discussion of these agencies see Chapters X and XI.)

The surgery of chronic pelvic peritonitis is largely involved in the surgery of chronic metritis and salpingo-oöphoritis. When adhesions exist they are to be severed by the fingers or scissors, and all raw surfaces carefully covered with peritoneum when possible. The acutal cautery is a fair substitute when used to char the raw surfaces. Failure to observe these rules may lead to the reformation of new adhesions, to oozing of blood, and perchance to ileus.

CHAPTER XXII

PARAMETRITIS (PELVIC CELLULITIS)

Acute Parametritis
Chronic Parametritis
Varicocele of the Broad Ligament

The loose connective tissue of the pelvis lies immediately beneath the peritoneum. It surrounds the supravaginal portion of the cervix, and extends laterally between the layers of the broad ligament and along the sides of the pelvis. There is but a small amount of connective tissue in front of the uterus, beneath the vesico-uterine fold of peritoneum. Behind the uterus and beneath the uterorectal fold of peritoneum is a considerable amount of loose connective tissue, so intimately associated with the rectum, cervix, and vagina that it frequently becomes the seat of infection.

A knowledge of the location, loose texture, and relation of the connective tissue to the neighboring structures will serve as a basis for our understanding of pelvic cellulitis.

Definition.—By parametritis is meant an inflammation of the cellular tissue of the pelvis. The extent of the lesion varies. While sometimes diffuse, it is usually localized. According to the location of the lesion we recognize paracystitis, when the limited amount of connective tissue about the base of the bladder is involved; paraproctitis, when the inflammation is in the cellular tissue about the rectum; paravaginitis, when it is about the vagina; posterior parametritis, when in the connective tissue lying within the uterosacral folds and beneath the floor of the pouch of Douglas; lateral parametritis, when between the layers of the broad ligament.

Classification.—Freund classifies parametritis as follows:

I. Acute Inflammation of the Pelvic Connective Tissue with or without Abscess Formation.

1. Simple phlegmon.
2. Septic phlegmon.

II. Chronic Inflammation of the Pelvic Connective Tissue.

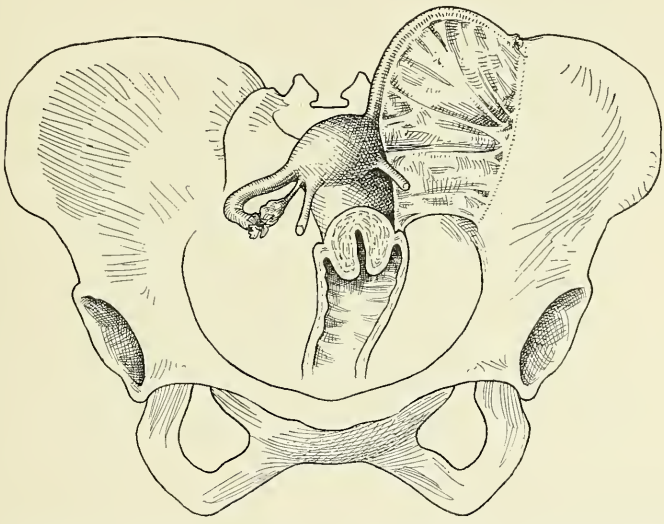
1. Circumscribed atrophic.
2. Diffuse atrophic.

The causes of pelvic cellulitis are identical with those of pelvic peritonitis, and these lesions rarely exist singly.

Acute Parametritis.—The initial symptoms are usually less violent than in acute pelvic peritonitis. This is particularly true of pain and tenderness. The effect upon the pulse and temperature may be equally severe.

Bandl says: "If a day or two after an attack of fever and the appearance of the initial symptoms, the uterus is found enlarged transversely in the region in which the broad ligaments leave it, parametritis certainly exists, and it is hardly necessary to prove it by bimanual examination. If, after fever has lasted for several days, points of resistance are found over Poupart's ligament corresponding to the seat of pain and tenderness; or if swellings have formed above or extend to the centre of Poupart's ligament, or internally to the anterior superior spine of the ilium, the convex border of which is readily felt or even seen; or if, by firm pressure on the abdominal wall, tumors corresponding to the broad ligament are found, then it is also certain that the process involves the parametrium. If still doubtful, the diagnosis may be confirmed by vaginal examination, which in most cases will reveal the presence of large masses at the sides of the uterus, extending anteriorly or laterally to the pelvic wall, or filling one side of the pelvic cavity, showing clearly that the swellings felt through the abdominal wall are masses of exudate extending below the peritoneum."

FIG. 348



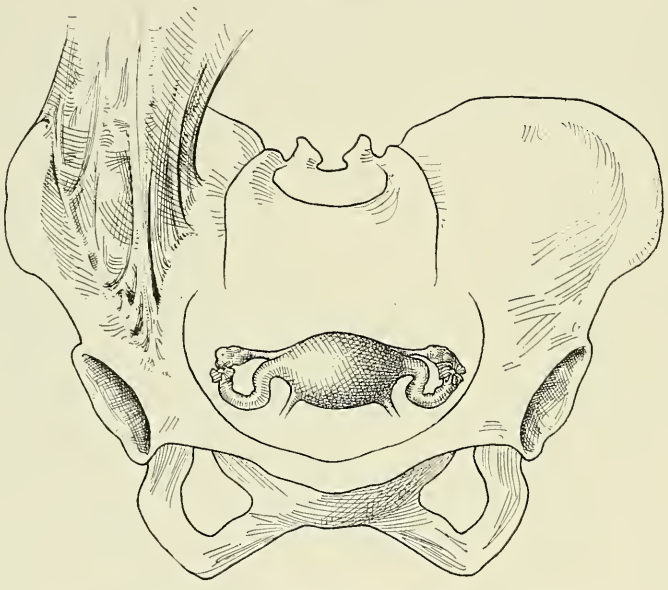
Contraction of the left broad ligament, drawing the uterus in a left lateral position.

In many cases the exudate cannot be felt through the abdominal wall, because it lies low in the pelvis and is only to be palpated through the vagina. "If, with more or less inflammatory symptoms, masses form in the neighborhood of the cervix, or extend to the deeper portions of the pelvis, being doughy and soft at the beginning, but rapidly becoming harder, or if large, well-defined swellings form in the true pelvis, in front of or behind the uterus, the process can be none other than phlegmonous inflammation of the cellular tissue." (Bandl.)

Chronic Parametritis.—Chronic parametritis is diagnosticated from the position and consistency of the exudate and from its relation to neighboring structures. The history of the infection, together with the general and local symptoms, can no more than suggest the probable nature of the lesion.

Position of the Exudate.—The exudate occupies the position of the pelvic connective tissue with greatest frequency in localities in which the connective tissue is most abundant, namely, behind the uterus and between the layers of the broad ligaments. In either case the exudate lies low in the pelvis.

Fig. 349



Perityphlitic adhesions. Uterus and appendages are not involved.

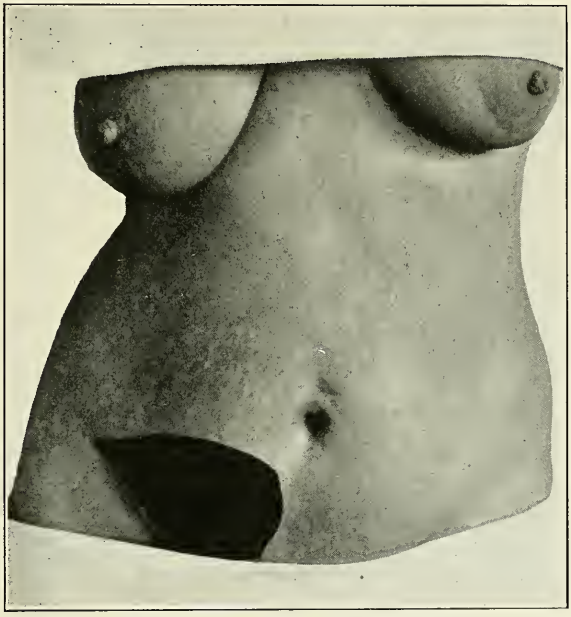
When involving the connective tissue at the base of the broad ligaments, the exudate spreads to the sides of the pelvis. Behind the uterus it bulges down into the vagina, forming a rounded, tender swelling in the cul-de-sac. When involving the connective tissue at the sides of the pelvis, it spreads into a flat mass which extends from the sides of the uterus toward the sides of the pelvis.

It is possible for the exudate to dissect in front and behind in the subperitoneal connective tissue of the abdominal wall. It is impossible for the exudate to burrow above the umbilicus, because at this level the subperitoneal connective tissue disappears. Furthermore, the dissection cannot go beyond the median line of the abdominal wall. In this manner an abscess may burrow, there being a greater tendency

on the part of purulent collections to gravitate to a lower level than is the case with non-suppurative exudates. The abscess may finally be discharged through the bladder, vagina, rectum, abdomen, or through one of the pelvic foramina.

The form of the exudate varies according to its consistency and location, and moulds itself to neighboring structures. Beneath the cul-de-sac of Douglas it is somewhat rounded because of the limited resistance offered by the surrounding soft structures. Between the resisting layers of the broad ligaments the exudate is flattened, and the same is true to a greater degree at the sides of the pelvis. As the exudate is absorbed its form changes, because the absorption proceeds irregularly.

FIG. 350



Inflammatory exudate in right broad ligament.

Mobility of the exudate is scarcely perceptible. If attached by a broad base to an immovable structure, the exudate will be firmly fixed. A small exudate within the broad ligament may show some degree of mobility, but, as a rule, we speak of cellular exudates as fixed and immovable.

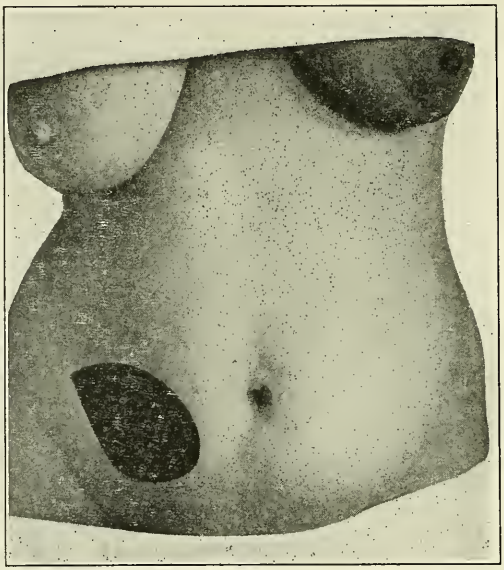
The *consistency* is also subject to great variations, depending upon the character of the exudate, whether edematous, fibrinous, or purulent. It may be soft and fluctuating, and again as firm as cartilage. In the early development of the exudate the consistency is elastic and yielding; later it becomes firm from organization and contraction. If suppura-

tion ensues there will be a boggy and possibly fluctuating mass. The consistency is best determined by rectal and vaginal palpation.

Tenderness to pressure is characteristic of all inflammatory lesions. Large exudates may exist with little tenderness, but tenderness is a reliable guide to the inflammatory character of the mass.

The relation of the exudate to neighboring organs is important in differentiating from new formations in the pelvis. The exudate blends intimately with adjacent structures and cannot be outlined apart from them. In intraligamentous exudates the mass lies snugly against the side of the uterus, sometimes surrounding the supravaginal portion of the cervix, but never extending to the fundus. In para-

Fig. 351



Appendicular exudate.

vaginitis it may be impossible to move the vaginal mucosa from the exudate. In paraproctitis the exudate may bulge into the rectum, narrowing the bowel lumen, and so intimately blend with the wall of the rectum that it moves as one mass. In the absorption of the exudate the periphery is first to disappear. In an intraligamentous exudate the mass may retreat from the side of the pelvis and form an elongated or rounded swelling, firmly adherent to the uterus.

Differential Diagnosis.—The distinction between a perimetric and a parametric exudate is at all times difficult. Certain well-defined points of distinction serve to differentiate the two lesions, but they commonly coexist.

Parametritis	Pelvic Peritonitis
1. Exudate lies low in the pelvis.	1. Lies high in the pelvis.
2. Pain may not be great, and is dull and continuous.	2. Pain usually more intense, sharp, lancinating and paroxysmal.
3. Exudate commonly at the side of the uterus, never extending to the fundus.	3. Exudate commonly behind the uterus, often extending to the fundus.
4. Exudate of firm consistency; tendency to suppuration.	4. Commonly less firm; no great tendency to suppurate.
5. Uterus partially fixed.	5. Uterus may be firmly fixed.
6. Tympanites usually absent.	6. Tympanites usually present.
7. Facial expression may be natural.	7. Facial expression anxious.
8. Nausea and vomiting not common.	8. Nausea and vomiting present.
9. One leg flexed.	9. Both legs flexed.

Retro-uterine Parametritis	Retro-uterine Perimetritis
1. Outline rounded below and sharply circumscribed.	1. Outline diffuse, not sharply circumscribed.
2. Exudate cannot extend to fundus.	2. Exudate may extend above fundus.
3. Uterus may be crowded forward; usually only the cervix is crowded forward.	3. Uterus may be crowded forward by the exudate or drawn backward by adhesions.
4. Rectum firmly and closely surrounded by exudate in front and at the side.	4. Rectum crowded backward by exudate.
5. Mucosa of rectum does not move upon the exudate.	5. Mucosa moves independently of the mass.
6. Posterior vaginal fornix depressed.	6. Usually not depressed.

A paratyphlitic exudate is not infrequently confounded with an intraligamentous parametritis. It is possible for a paratyphlitic exudate to burrow between the layers of the broad ligament to the side of the uterus.

Perityphlitis	Parametritis
1. Initial symptoms: nausea, vomiting, constipation, fever, pain at McBurney's point.	1. Initial symptoms: fever, constipation, pain low in the pelvis at the side of the uterus, rarely nausea and vomiting.
2. Tendency of a perityphlitic abscess to rupture into the bowel and peritoneal cavity.	2. Little tendency to rupture into the bowel and peritoneal cavity.
3. Tendency to recurrence.	3. Tendency to recurrence not so great.
4. Exudate lies high on the right side and spreads from above downward.	4. Exudate lies low in the pelvis and spreads from below upward.

A pelvic hematoma may so closely resemble a parametric exudate as to be indistinguishable without an exploratory incision or puncture. Both lesions are confined to the cellular tissue of the pelvis, and in general contour, size, and consistency they may be quite similar. The following tabulated points will usually serve to differentiate the two:

Pelvic Hematoma	Parametritis
1. Develops suddenly.	1. Develops more gradually.
2. History of ectopic pregnancy.	2. Absent.
3. Onset marked by normal or subnormal temperature and rapid, feeble pulse.	3. Onset marked by rise of temperature and increased pulse rate.
4. Exudate usually beside the uterus and circumscribed.	4. Exudate beside or behind the uterus and less circumscribed.
5. Exudate at first doughy, later firm, never tender unless infected.	5. Exudate firmer and tender.
6. Exploratory puncture—blood.	6. Exploratory puncture—serum, pus, or negative.

Subserous fibroids may be confounded with a parametric exudate. When the exudate is round and attached by a broad base to the uterus and not especially tender to pressure, the diagnosis is difficult, and may not be cleared up without an exploratory incision. The difficulty in diagnosis is especially great in intraligamentous fibroids. The more movable the mass, the more likely it is to be a fibroid. In a cellular

exudate there is a history of infection and the mass grows rapidly. But in fibroids there is no history of infection, and the growth develops slowly. The depth of the uterine cavity is usually increased in uterine fibroids beyond that found in parametritis. The effects of treatment will aid in the diagnosis; in parametritis the mass should diminish under treatment, while in fibroids little or no effect will be observed.

Malignant disease of the pelvis, involving the parametrium, may arise from a primary focus in any of the pelvic viscera. There is absence of a history of infection, no acute onset being experienced, and there are present the general symptoms of malignancy rather than of infection. The primary seat of malignancy can usually be determined, and the hard, irregular character of the infiltrated area will serve to indicate the condition.

Parametritis	Psoas Abscess
1. Usually of acute origin.	1. Usually of chronic origin.
2. Absence of spondylitis.	2. Spondylitis present.
3. Exudate tender to pressure.	3. Exudate not tender to pressure.
4. Fluctuation may be absent; induration about abscess always present.	4. Fluctuation only occasional; no hard exudate about abscess.
5. Thigh flexed, not rotated.	5. Thigh flexed and rotated inward.
6. Temperature may be high.	6. Temperature absent or slight rise, especially in the morning.
7. Exploratory puncture shows absence of tuberculous exudate and tubercle bacilli.	7. Presence of tuberculous exudate and possibly tubercle bacilli.
8. Tuberculin gives no reaction.	8. Tuberculin usually gives a reaction.

Treatment.—The treatment of pelvic cellulitis is in many respects similar to that of pelvic peritonitis.

In acute pelvic cellulitis identical conservative measures are practised. The patient is confined to her bed, an ice-bag is placed over the hypogastrium, oft-repeated hot vaginal douches are administered, the diet is restricted, and the bowels freely opened. As the acute stage passes away, glycerin and ichthyol tampons are applied daily.

If an abscess develops it should be drained per vaginam. (See page 517.)

When the pain is severe opium suppositories or hypodermic injections of morphine must be administered.

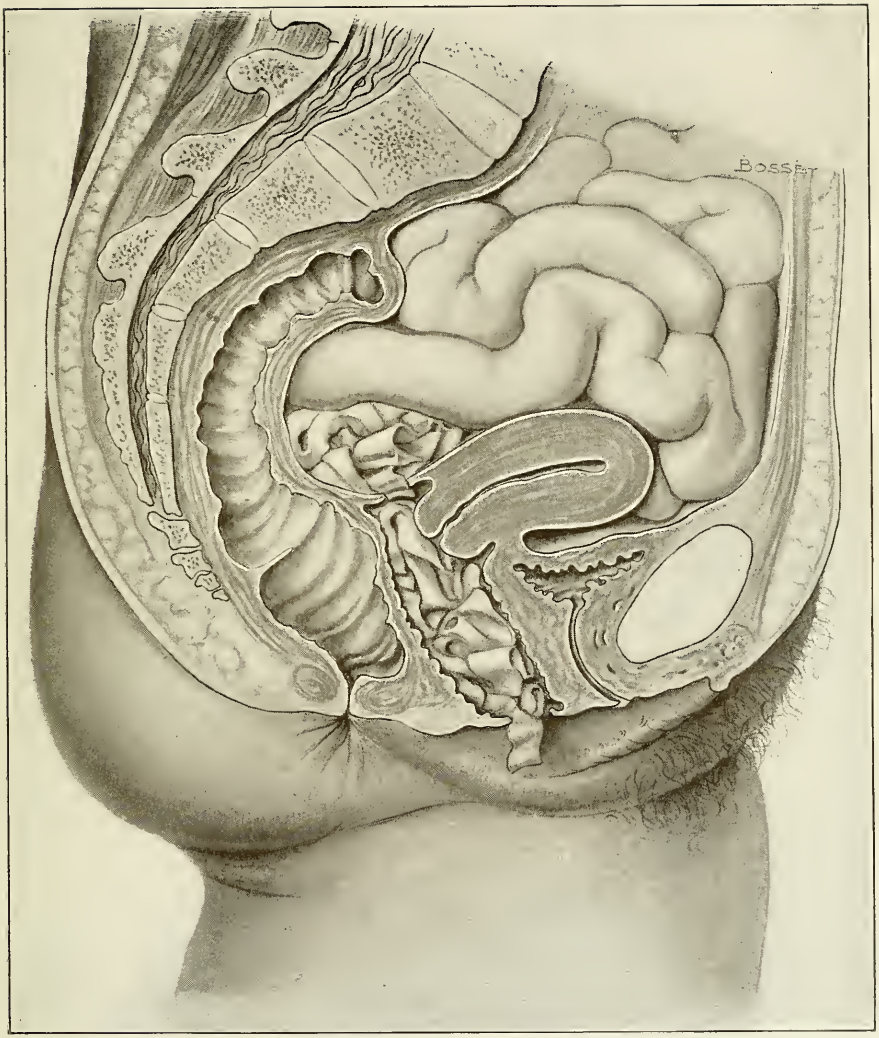
In chronic pelvic cellulitis the treatment consists in the usual conservative measures employed in the management of chronic pelvic inflammation in general. Prolonged hot vaginal douches, ichthyol and glycerin tampons, pelvic massage, and pressure therapy are applied in accordance with the rules laid down in Chapters X and XI. When a pelvic abscess exists it should be drained. (See page 517.)

Treatment of Pelvic Abscess.—The treatment of abscesses resident in the pelvic peritoneal cavity or in the pelvic connective tissue, exclusive of pyosalpinx and ovarian abscess, is drainage per vaginam.

This is by no means a minor procedure, in that it must be effectually done and without injury to neighboring structures or contamination of the general peritoneal cavity.

The more acute the infection the greater the danger of its extension, and the higher the location of the abscess, the more difficult the opera-

PLATE XXV



Method of Packing Douglas' Pouch for Drainage in Cases of Pelvic Abscess.

tion and the greater the danger of injuring the surrounding structures, especially the bowel.

Two or more separate abscesses may exist, and it is important that an outlet common to all of them should be made.

Technic.—The vulva and vagina are prepared in the usual manner for operation. It is, as a rule, advisable to give a general anesthetic, though the operation may be performed without anesthesia when the patient is greatly depressed.

The cervix is exposed by a hanging speculum and two lateral retractors. The posterior lip of the cervix is grasped by a vulsellum forceps and firm traction is made forward and upward. The vaginal wall is grasped by tissue forceps at a point immediately back of the cervix, and with sharp-pointed scissors a transverse incision is made in the posterior fornix of the vagina close to the cervix. This incision extends through the wall of the vagina only, and is about one inch in length.

A strip of gauze is then draped over the index finger and by the finger the opening is stretched, the connective tissue is stripped from the cervix, and the finger directed to the seat of the abscess.

Having opened into the abscess with the finger the drainage is made more free by stretching the tissues. A careful digital exploration is made in view of the possible finding of other accumulations of pus, and when found they, too, are opened and drained.

When the abscess lies high in the pelvis it may be necessary, in order to reach it, to pass long blunt forceps beyond the reach of the finger, and when the abscess has been entered, the forceps is spread to allow the free escape of the contained pus. This is a dangerous procedure, and one that requires experience and skill. In exceptional cases the abscess should be opened above Poupart's ligament.

After making a free opening through the cul-de-sac into the abscess, the cavity is packed with a long strip of antiseptic gauze. The author advises against irrigating the abscess cavity, immediately after opening, for fear of spreading the infection.

The gauze pack should be removed at the end of forty-eight hours and a vaginal douche given. So long as the abscess drains freely, only antiseptic vaginal douches should be given, but if free drainage is interrupted, the incision should be spread with fingers or forceps and the cavity washed out with an antiseptic solution. When it is difficult to obtain continuous free drainage a fenestrated rubber drainage-tube should be inserted and the cavity irrigated daily through the tube. In all acute pelvic abscesses the patient should be kept in the Fowler position.

After the abscess has completely drained, the surrounding inflammatory tissue should be treated with vaginal douches and glycerin and ichthyol tampons.

Varicocele of the Broad Ligaments.—Varicocele of the broad ligaments is rarely met with independent of other pelvic or abdominal lesions. The ovarian veins are known to undergo great enlargement in pregnancy,

and it might be expected that these veins would occasionally fail to involute in the puerperium. As the result of sexual excitement and menstruation the veins of the broad ligaments become overdistended. These factors may lead to permanent overdistention of the veins. The following conditions are mentioned as etiological factors:

1. **General Causes.**—Incompetent heart, diseases of the lungs, kidneys, spleen, and liver, which lead to a sluggish pelvic circulation.

2. **Local Causes.**—Subinvolution of the uterus, pelvic inflammation, abdominal tumors and ascites, extensive lacerations of the cervix into the broad ligaments, uterine displacements, chronic constipation, and tight-lacing; all of which tend to engorge the pelvic veins.

Symptoms.—The symptoms are usually marked by those emanating from the associated lesions. There is a sense of weight and fulness in the pelvis which is commonly referred to the iliac, sacral, and perineal regions. This feeling of discomfort is aggravated by long standing and is relieved by lying down.

Diagnosis.—The symptoms recorded above will be highly suggestive. The diagnosis is not usually made before the abdomen is opened, and is then often overlooked, because in the Trendelenburg position the veins are collapsed. It is sometimes possible to make the diagnosis by palpating at the sides of the uterus a yielding compressible mass, varying in size to that of a hen's egg.

Treatment.—All associated conditions demand consideration. Conservative measures may afford relief; such are the introduction of a pessary to correct a displaced uterus, the depletion of the pelvis by catharsis, hot vaginal douches, and rest.

Operative treatment, in event of failure of the conservative measures, consists in multiple ligatures with linen along the course of the distended veins. The author does not find it either necessary or advisable to dissect out the distended veins.

CHAPTER XXIII

GONORRHEA IN WOMEN

Historical Sketch
Gonococcus of Neisser
Etiology
Diagnosis
Prognosis
Prophylaxis
Treatment
Gonorrhea in Children

Historical Sketch.—The prevalence of gonorrhea was not fully appreciated before Noeggerath made known his clinical observations in New York City, in 1877. Two years later Neisser identified the gonococcus as the essential causal factor and made possible the recognition of latent cases which hitherto had not been recognized.

The statistics of Noeggerath created a furore of criticism and ridicule. He stated that 80 per cent. of married men have had gonorrhea, that 90 per cent. of these have never been healed, and that of five married women, three have gonorrhea. Zweifel and Sänger took issue with Noeggerath and estimated that 18 per cent. of married women have gonorrhea. The author is convinced that the truth lies between the statements of Noeggerath and those of Zweifel and Sänger.

Gonococcus of Neisser.—The gonococcus of Neisser is a diplococcus averaging 1.25 mm. in diameter, with an interspace of about 0.8 mm. between the two halves of the organism. Occasionally groups of four cocci are seen, and more rarely single cocci exist. The organism grows best at body heat, but its growth is not retarded at freezing temperature or at a corresponding high temperature. It will not grow on gelatin or agar, but on blood serum plus peptone-agar (Wertheim) the organism grows slowly. It grows in a neutral, slightly alkaline, or faintly acid medium. When dry it soon perishes, hence the dried secretions soon lose their virulence. The gonococcus can exist in the tissues throughout the lifetime of the individual, and at any time under favorable influences the infection may light up into what appears to be a new and acute infection, or may transmit a virulent infection without itself becoming manifest.

Etiology.—*Frequency.*—Wolbarst says that 75 to 90 per cent. of all gynecological operations are occasioned by gonorrhea. The number of gonorrheics in New York City is estimated at 225,000 to 800,000. It is estimated by Gerrish that in New York City in 1900, 225,000 men and women died from gonorrhea and syphilis. Hoff estimated an increase of 50 per cent. of venereal diseases in the United States Army in the period in 1899 to 1905.

The section in Hygiene and Sanitary Science of the American Medical Association reported in 1901 that in the experience of many European

and American gynecologists, 40 per cent. of women suffering from pelvic inflammation have gonorrhea. Wolbarst makes the startling statement that 70 per cent. of married women who complain of pelvic disorders have acquired gonorrhea innocently from their husbands.

Extracongugal Infections.—It is exceptional for gonorrhea to be conveyed by means other than sexual intercourse. Gonorrhea may be conveyed to the eyes of the newborn. The bathroom is an occasional source of contagion, and cases have been traced to the dispensary and office where the instruments and hands of the examining physician were not properly cleansed. Children attended by infected mothers and maids are sometimes contaminated.

Immunity.—Immunity may be acquired, though an individual may be repeatedly infected. General immunity to gonorrheal infection does not exist. Certain tissues, notably gland tissues, appear to be immune. Local immunity in certain tissues, notably the mucosa of the urethra, is said to exist for a brief time; however, this fact is not fully established. A second infection may soon follow the first. The immunity exists only so long as the tissues are under the direct influence of the gonotoxins or of gonococci.

The discharge, accompanying a chronic gonorrheal urethritis or endometritis, is proved to be virulent only when the microscope reveals the presence of gonococci or when sexual intercourse results in infection. The amount of the discharge or its constancy does not indicate the degree of virulence. We have demonstrated the presence of the gonococcus in the absence of a discharge, and we have failed to detect the gonococcus in the presence of a chronic discharge.

Individuals have been known to infect others, yet apparently are themselves immune to infection. The explanation lies in the presence of a chronic gonorrheal infection, in the absence of all clinical signs. In the first individual the gonococcus had little virulence, but when transmitted to sterile tissues it assumed an active role.

Husband and wife may both be infected, neither manifesting symptoms of the disease, yet a third individual having intercourse with one or the other may acquire a virulent infection. Again, the husband may infect his wife, then have no intercourse with her until he is apparently cured, when on resuming sexual relations with his wife whom he had previously infected, he, in turn, is inoculated by her.

A gonococcus of low virulence when transferred to a second individual may acquire added virulence. In this manner a husband, who is the carrier of a latent unrecognized infection, may infect his wife and in turn become acutely infected.

Period of Inoculation.—It is not possible to establish a definite period of inoculation, but it is said to vary from twelve hours to a week or more. Experimental inoculations with pure cultures of the gonococcus have created an inflammatory reaction in twelve to twenty-four hours.

Pathology.—In the *urethra* we find, during the acute stage, that the gonococcus advances by way of the intercellular spaces to the deeper structures of the mucosa and into the underlying connective tissue.

As the acute stage merges into the chronic, there is a less diffuse distribution of the organism and the leucocytes, the gonococci confining themselves to isolated areas in the superficial structures, particularly those areas which present to the unaided eye congested and ulcerated regions.

Infection of the glands of the urethra is of frequent occurrence and presents a serious complication because it is in these follicles that the gonococcus may reside for an indefinite time and elude all the ordinary means of treatment. Skene's ducts and para-urethral glands frequently give origin to retention cysts and abscesses. Caruncles grow in the anterior third of the urethra as the result of constant irritation. These sensitive growths are single or multiple, and are composed of a loose vascular infiltrate covered with mucosa. Erosions, red areas, and gray plaques may be seen distributed irregularly over the surface in chronic gonorrheal urethritis. The urethral wall may present a diffuse or circumscribed area of infiltration, which in healing may develop sclerosed bands. It is rare, however, to find a well-developed inflammatory stricture in the female urethra. The author has never observed one.

The surfaces of the genital tract which are covered by stratified, squamous epithelium, *i. e.*, vulva, vagina, and vaginal portion of the cervix, evince a peculiar resistance to gonorrheal infection during the period of sexual maturity. In infancy and old age the epithelium has a much lower resistance, and primary gonorrheal vulvovaginitis is not uncommon.

In the height of the infectious process the papillæ are crowded with small round cells. On the surface of the mucosa is a deposit of pus cells and cellular debris, and in this deposit are found gonococci in varying numbers. These organisms extend into the intercellular spaces of the epithelium, but have not been demonstrated to invade the underlying connective tissue.

The vulvar glands, which may be found in great numbers in advance of the hymen and in the fossa navicularis, may be infected and form shot-like elevations from which pus can be expressed. The term *folliculite vulvaire blennorrhagique* has been applied to this lesion by Record, Rollete, and Martineau. The gonococcus has been found in the expressed pus.

Gonorrheal folliculitis of the vulva may result in the formation of fistulæ by the opening of these abscesses into the vagina and bowel. Such a condition is rare.

The Bartholinean glands, which are frequently involved, are said by Bumm not to be deeply invaded by the gonococcus. According to Gebhard, all deep-seated infections of the Bartholinean glands are the result of mixed infections of the gonococcus and staphylococcus.

In the *uterus* numerous groups of gonococci were seen to occupy spaces between the superficial epithelial cells and, to a lesser extent, the intercellular connective-tissue spaces. Madlener made histological observations in a case ten weeks after the initial infection, which was

the seventh week of the puerperium. In this case gonococci were distributed throughout the entire uterine musculature.

In the *Fallopian tubes* the gonococcus has been repeatedly recognized in the pus contained within the lumen of the tubes and in the mucous lining. Morax and Raymond found the gonococcus in the superficial layer of the mucosa. Bumm found nests of gonococci in the mesosalpinx, as did also Wertheim.

The *ovary* is rarely attacked by the gonococcus in the absence of a previously infected tube. Under rare conditions the ovary may be attacked by way of the peritoneum, the microörganisms passing through the intact germinal epithelium of the ovary or into the open follicles. Again, it is possible for the gonococcus to pass through the uterus by way of the lymph vessels of the broad ligaments to the hilum of the ovary.

Peritoneum.—Localized pelvic and general abdominal peritonitis, due to gonorrheal infection, has rarely been demonstrated by bacteriological observations, though clinically it is well known. Cases of general gonorrheal peritonitis are reported by Koehler, Frank, Cushing, Veit, and Menge. Hunner and Harris reported seven cases, and gave an analysis of thirty-nine previously reported cases.

Little is known of gonorrheal infection of the *pelvic connective tissue.* That gonorrheal abscesses do form in connective tissue is demonstrated by Wertheim, Dinkler, and Jadessohn, but the bacteriological observations which have been carried on in cases of pelvic cellulitis of gonorrheal origin have led to great confusion.

The *bladder* is seldom attacked by the gonococcus. Wertheim, Bierhoff, Barlow, and others have all recognized the lesion. Wertheim has demonstrated the presence of gonococci in the intercellular spaces and in the bloodvessels of the bladder wall. It is at the base of the bladder that the lesion commonly exists, though a generalized gonorrheal cystitis has been recognized by a large number of observers.

The *urine* contains a variable amount of pus and bladder epithelium, sometimes red blood cells, and is alkaline in reaction. In the acute stage gonococci are usually found in the pus cells.

Baier found the *rectum* involved in 30 per cent. of 191 cases of gonorrhea. Fissures, erosions, and ulcers may accompany a swelling of the rectal mucosa. The majority of cases are not recognized for want of a bacteriological examination of the mucous secretions of the rectum. In nearly every instance the genito-urinary tract is likewise infected.

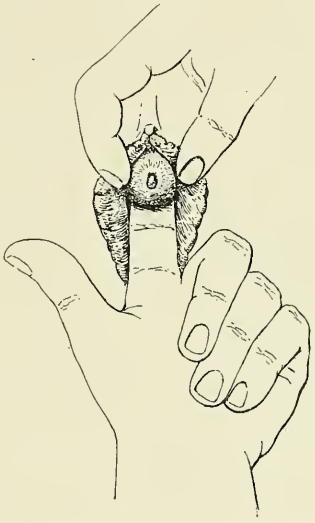
Diagnosis.—The diagnosis of the presence of a gonorrheal infection is generally an easy task, but it is difficult to determine the extent to which the infection has spread.

History.—It is possible to make a practically correct diagnosis from the history alone. A recently married woman may complain of leucorrhea and burning pain on urinating, and it is learned that her husband was at one time infected. In such cases there is little doubt of the existence of gonorrhea, but without a physical examination the diagnosis cannot be established, nor is it known how far the infection

has extended. A woman may acquire a gonorrheal infection without her knowledge and in the absence of all local and general signs; hence the uncertainty of relying upon the history.

Gonorrheal Urethritis.—The acute attack is ushered in by a tickling and burning sensation before and after urinating. There is a transparent serous secretion, in which pus cells, desquamated epithelium, and gonococci are found in variable numbers. By the end of the third day the secretion becomes thick and yellow. There is tenderness along the course of the urethra, and not infrequently in the bladder. Separating the labia with the fingers the meatus appears red and swollen, and from the urethra there may be expressed a drop or more of pus. In three or four weeks the urethra usually appears normal, though a drop of pus can sometimes be expressed by stripping the urethra. In a small

FIG. 352



Expressing a drop of pus from the urethra.

proportion of cases the lesion passes into a chronic stage, in which the urethra becomes firm from thickening. Through the endoscope part or all of the urethra appears swollen, having little or no secretion. Strictures are seldom formed. Exacerbations, with all the usual manifestations of a recent acute infection, are the rule. These exacerbations can usually be explained by the presence of gonococci in the crypts near the meatus. From these crypts pus, which contains gonococci, can often be expressed in the absence of an apparent lesion elsewhere in the urethra. The severity of the symptoms of urethritis does not depend so much upon the acuteness of the lesion as upon the location. The farther the infection extends into the urethra, the more intense the suffering. A posterior urethritis gives rise to symptoms resembling cystitis. The desire for urination is frequent and

painful, sometimes amounting to tenesmus. Urination is difficult, and sometimes it is impossible to void the urine, thereby necessitating the use of the catheter. The desire for urination may be great, even when there is but little urine in the bladder. This desire may be experienced only at night or may be worse when the patient is on her feet. Such are the most severe types. In the majority of chronic cases there is no great pain on urinating.

Gonorrheal Cystitis.—When a patient complains of a persistent frequency of urination associated with pain in the bladder, two things are required of the physician: (1) A microscopic examination of the urine obtained by means of the catheter, in view of finding pus cells and the gonococcus; (2) a cystoscopic examination, to determine the location and extent of the infection.

The gonococcus plays a minor role in the causation of cystitis. The germ is usually far outnumbered by other microörganisms—the colon bacillus, streptococcus, and proteus of Hauser. When the gonococcus is the initial cause of the infection it usually gives way to the above-mentioned microbes. Young, however, has found a pure culture of the gonococcus in cystitis of five years' standing. While the gonococcus has been found in the pelvis of the kidney and in the cortex of the kidney, the question is still under dispute as to whether the infection of the kidney is due to direct extension from the bladder and ureters or is conveyed by way of the blood current. The weight of evidence is in favor of direct extension. As with the bladder so with the kidney, the gonococcus is usually associated with the colon bacillus and other microörganisms.

Gonorrheal vulvitis is often seen in childhood, but is rare in advanced years. It seldom exists in the chronic stage because of the rapidity with which healing takes place. As a rule, the vulva is primarily infected in infants, but in adults it is generally secondary to a uterine infection.

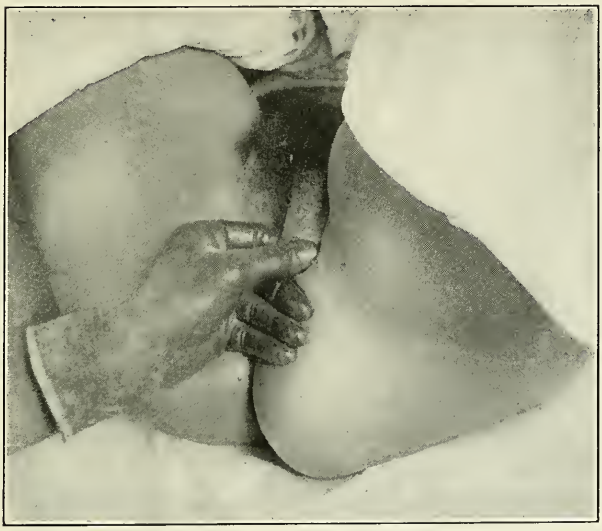
In acute gonorrheal vulvitis the tissues are deeply congested and the surface is covered with pus or a pseudodiphtheric membrane. Underneath the secretion superficial or deep ulcers may form; they are sensitive and bleed to the touch. The pus accumulates in the fossa navicularis. The hymen is swollen and red. Eczema of the labia and neighboring skin arises from lack of cleanliness. The vulvar glands may be infected and transformed into numerous small abscesses containing gonococci. Associated with these changes are sensations of heat and burning about the external genitals, burning on urinating, and embarrassment in walking and sitting. These subjective symptoms usually disappear in three to five days, and within two weeks little or no trace of the lesion remains. Healing is slower in childhood and in old age.

Gonorrheal bartholinitis may be in evidence as early as the second week of the infection, but, as a rule, these glands are not involved for weeks and months following the initial infection. The mouths of the glands become red and swollen. Here the process may be checked or

the glands may enlarge into a round or spindle-shaped body, varying in size from a hazel-nut to a hen's egg. They are tender, and may fluctuate. Both glands are commonly involved, though not to the same degree.

Gonorrheal vaginitis is rarely if ever seen in the chronic stage. In the acute stage it is occasionally seen in infancy and old age as a primary lesion, but in the period of sexual maturity it is invariably secondary to a uterine infection. The finding of the gonococcus in the vagina is not evidence of gonorrheal vaginitis. The gonococci may lie in the vaginal secretions without attacking the vaginal tissues. In the acute stage the temperature may be elevated, there is a burning sensation in the vagina, physical exertion causes distress, and to the examining

FIG. 353



Palpation of the vulvovaginal gland.

finger the vagina is hot and tender. The surface is red and swollen, and in virulent cases erosions and ulcers may develop beneath the purulent secretion which bathes the surface. The disease is usually self-healing within a few weeks.

Gonorrheal metritis exists in both the acute and chronic stages. The infection may be confined to the cervix or may invade the uterine body. It is not invariably confined to the mucosa, as was formerly believed, but may invade the musculature throughout its entire extent.

In the *acute stage* the cervix is red, swollen, sensitive to pressure, and may bleed on handling. A mucopurulent secretion extrudes from the cervical canal, and in this secretion the gonococcus is found in large numbers throughout the acute stage. So long as the infection is confined to the cervix there may be an absence of all symptoms. With

the invasion of the uterine body the temperature usually rises a degree or more, there is pain and tenderness in the hypogastrium and urination is frequent and painful. As a rule, the symptoms rapidly subside, with the exception of a profuse leucorrhea, which commonly persists indefinitely. On bimanual examination the uterus is tender to pressure and is slightly enlarged.

Chronic gonorrheal metritis may be so varied and so obscure in its clinical manifestations that the true nature of the infection, and even the existence of an infection, might be overlooked without a systematic bacteriological examination. All the usual symptoms may be wanting. A careful examination of the uterus may reveal no change in its size, mobility, and consistency. There may be no undue sensitiveness and an absence of a visible secretion, yet the gonococci may be found in the transparent, viscid secretion of the cervix. Erosions are often seen on the cervix, and the entire uterus may be enlarged, firm in consistency, and somewhat tender to pressure. Exacerbations of pain, tenderness, and a purulent leucorrhea are suggestive of gonorrheal infection.

There is nothing in the macroscopic or microscopic appearances of the tissues of the uterus that will characterize a gonorrheal infection. The tissue changes are identical with those of puerperal infection. On the vaginal portion of the cervix are erosions of the papillary, glandular, and follicular varieties. In the cervix and body of the uterus the macroscopic appearances are those of endometritis of the hypertrophic, polypoid, or fungous types, which under the microscope present the usual picture of glandular or interstitial endometritis. *It is only by the detection of the gonococcus in the tissues that the diagnosis can be made with certainty.*

Gonorrheal salpingitis is always secondary to an infection of the uterus. It is exceptional for the infection to be conveyed to the tubes early in the history of the infection. While the tubes have been invaded within ten to fourteen days of the initial infection in the cervix, the rule is that they are not attacked for months and possibly years. A guarded prognosis, therefore, should always be given in regard to the involvement of the tubes while the infection is confined to the uterus, as it is not known when the infection may extend to the tubes.

The Predisposing Causes of Extension to the Tubes are: 1. Untimely intra-uterine manipulations in the infected uterus by means of the sound or curet.

2. Exposure and exertion during the menstrual period.

3. Labor and abortion, causing an extension of a latent infection in the uterus to the tubes. Women who are the carriers of a latent infection in the uterus should not become pregnant.

Gonorrheal salpingitis is usually ushered in by a chill, followed by a rise in temperature of 1° to 4° F., together with the development of pain and tenderness in the sides of the pelvis. In event of menstruation, the periods are prolonged and painful, with exaggerated local and general disturbances.

Without an anesthetic it is impossible to outline the infected tubes because of the extreme tenderness. In the early stages the tubes are but slightly enlarged and are not readily palpated. As the disease develops the tubes may be palpated as an irregular, elongated structure, extending from the cornua of the uterus to the sides of the pelvis or lying closely adherent to the sides or posterior surface of the uterus. They are tender to pressure, and are, as a rule, more or less fixed by adhesions. It may or may not be possible to detect fluctuation. In the subacute and chronic stages exacerbations of fever, pain and tenderness are occasionally experienced. These are prone to occur at the menstrual periods and to follow undue exertion. Bladder and rectal disturbances are often included in the clinical syndrome, and are due either to infection of these structures or to pressure by the tender and enlarged tubes.

Gonorrheal ovaritis is the result of extension of the infection from the tubes to the ovaries, and does not exist independent of salpingitis. The clinical manifestations are identical with salpingitis.

All the inflammatory lesions common to the ovary are observed. Adhesions form about the ovary, binding it to the tube and surrounding structures. Newly formed connective tissue may develop in the substance of the ovary and lead to cystic degeneration. These changes in and about the organ are fruitful sources of sterility. In addition to these pathological conditions, abscesses of the ovary are not infrequently developed.

Gonorrheal peritonitis.—(See page 501.)

Gonorrhea of the rectum occurs in about 8 per cent. of all gonorrheal infections of the genital tract. The lesion is commonly overlooked. The contributing causes are coitus per anum, digital and instrumental examinations in the presence of gonorrheal infection of the genital tract, and lack of cleanliness in the presence of leucorrheal discharges of a gonorrheal nature. Caution should be exercised in giving enemata for fear of conveying an infective vaginal discharge to the rectum. When a patient, who is the carrier of a gonorrheal infection, complains of discomfort in the rectum, an effort should be made to discover the gonococcus. Only by this means is the disease recognized.

Prognosis.—Inasmuch as one cannot foretell the ultimate outcome of a gonorrheal infection, a guarded prognosis should always be given. The infection may be of low virulence and confined to a limited area. Such an infection may exist without recognition, but it may persist for an indefinite time and be transferred to a second individual, and then give rise to a virulent infection. Again, such a latent infection confined to the lower genito-urinary tract may ultimately spread to the upper genital tract, and with disastrous results.

Gonorrhea in Relation to Sterility.— A large proportion of sterile marriages are due to gonorrhea. Bumm estimates that 30 per cent. of women infected with gonorrhea are sterile. More than half of the women who have married men known to have had gonorrhea are sterile (Noeggerath). This statement is probably an exaggeration. Fully 70 per cent. of sterile marriages are chargeable to gonorrhea, either in

the husband or in the wife, or in both. Sterility is chargeable to the husband in 70 per cent. of cases according to the statement of Vedeler, in 50 per cent. according to Olshausen, and in 34 per cent. according to Chrobak. These figures refer not only to the percentage of sterility in the male, but to his part in rendering the wife sterile.

The so-called "one-child sterility" is accounted for in large measure by the extension of a preëxisting gonorrheal infection during the puerperium, for it is a long-established fact that in the puerperium the infection, which was confined to the cervix and urethra, is prone to extend to the corpus and tubes, and will then almost certainly result in sterility.

Influence of Gonorrhea on Pregnancy.—Gonorrhea is not necessarily a barrier to conception. In a number of the Continental hospitals it was found that 20 to 25 per cent. of pregnant women were infected. In them the infection was usually confined to the cervix and urethra, though it is well known that the body of the uterus and the appendages may be infected and not preclude the possibility of pregnancy.

Influence of Gonorrhea upon the Termination of Pregnancy.—Gonorrhea is a potent factor in the causation of abortions. Sänger estimates the abortive influence of gonorrhea to be as great as that of syphilis. It is estimated that 20 to 30 per cent. of women who are infected with gonorrhea fail to carry their children to full term.

One case in six of puerperal sepsis is caused by gonorrhea. Of this number but few are the result of contamination in labor and the puerperium. The majority are due to preëxisting infections in the genital tract, which are awakened to renewed activity and caused to extend; a gonorrheal cervicitis extends to the body of the uterus and thence to the appendages; a latent infection in the appendages spreads to the peritoneum; thus it happens that an infection which may have been previously unrecognized becomes a serious menace to life and a barrier to conception.

Risks to the Offspring.—In the passage of the child through the cervix and vagina of an infected mother, there is great liability to contamination of the conjunctiva. It is estimated that from 10 to 30 per cent. of the cases of blindness in the world are due to gonorrhea. According to Neisser there are now in Germany 30,000 blind persons whose loss of sight may be thus accounted for. Happily, the frequency of this accident is being materially reduced by antiseptic vaginal douches given prior to the delivery of gonorrheal cases and by the employment of the Credé method of treatment of the eyes of the newborn.

Location of the Infection.—The prognosis is largely influenced by the location of the infection. von Winckel presents the following statistics relative to the localization of gonorrhea:

Urethra, acute and chronic	62.0 to 85 per cent.
Cervix	47.0 to 72 per cent.
Uterus	14.0 to 50 per cent.
Vagina	23.0 to 40 per cent.
Bartholin's glands	36 per cent.
Vulva	12.0 to 25 per cent.
Tube	3.6 to 33 per cent.

Bumm made observations in 55 cases and found:

50 (90.0 per cent.) with gonorrheal urethritis.
41 (74.0 per cent.) with gonorrheal cervicitis.
8 (14.0 per cent.) with gonorrheal endometritis.
2 (3.6 per cent.) with gonorrheal salpingitis.

Prophylaxis.—The prevention of gonorrhea is a problem of vast importance because of the direful results of the infection and the uncertainty of cure. Following are essential features of prophylaxis:

1. The public should be impressed with the prevalence and serious consequences of the disease.

2. The physician should not pronounce a cure or give sanction to marriage or to the resumption of the marital relation until repeated microscopic examinations demonstrate the absence of the gonococcus in the secretions.

3. Medical regulation and supervision of prostitution does not protect but rather promotes a false sense of security.

4. So long as a woman is the carrier of gonococci, she should avoid becoming pregnant in the interest of both herself and child. The possible extension of the infection in the mother and the development of ophthalmia in the newborn justify the precaution.

Active Treatment.—Before deciding upon a course of treatment it is well to consider the social, economic, and moral influences which affect the individual. When the woman is able to take reasonable care of herself, and when her moral life would favor recovery, conservative treatment may be looked upon with favor; but when for financial and domestic reasons a long period of treatment and invalidism could not be wisely pursued and when the moral status of the individual will forestall all efforts toward recovery, conservative treatment will fail. Such women should be rid of their troubles in the shortest possible time, and to this end operative procedures are favored. "Thus immoral individuals would be made less a menace to the community, less a burden upon our hospitals, and the wage-earner would be more quickly fitted for pursuing her daily task."

Treatment of Acute Stage.—The most essential factor in the management of gonorrhea in the acute stage is *rest*. The patient should be confined to bed and all instrumental and digital manipulations interdicted for fear of spreading the infection.

Cleanliness is second in importance to rest. Antiseptic vaginal douches should be given for the purpose of keeping the vagina free of the leucorrheal discharges. Lysol, creolin, or bichloride douches are preferred. These douches should be given in the recumbent position, they should be at a temperature of 110° to 112° F., and should be given for ten to twenty minutes. The author's preference is for mercuric chloride (1 to 2000). In addition to the cleansing qualities of the douche the pelvic tissues are depleted, and in this manner the active stage of the infection is shortened. When pain and tenderness are referred to the pelvis an ice-bag should be applied to the lower abdominal region. For relief from pain, aspirin, heroin, morphine, and hyoscyamus

may be resorted to when rest and the application of the ice-bag fail to give relief. The diet should be free from stimulants and spices.

Under no circumstances is the uterine cavity or the cervical canal to be invaded in the acute stage with injections or with swabs for fear of extending the infection.

Surgery has no place in the treatment of acute gonorrhea, with the possible exception of vaginal drainage in event of an accumulation of pus in the pelvis, an occasion which will rarely arise in the early stage of the infection. In acute infection of the urethra and bladder all injections should be proscribed. Large quantities of water and milk should be drunk for the purpose of cleansing the urinary tract. Urotropin in 0.45 to 0.65 gm. (7 grains to 10 grains) doses, given three or four times a day, is said to have an antiseptic action, and is in general use.

Treatment of the Subacute and Chronic Stages.—Local measures may be instituted in from four to six weeks from the beginning of the infection, depending upon the virulence and extent of the infection.

Treatment of Subacute and Chronic Urethritis.—When there is distress from burning pain on urinating, the balsam of copaiba will afford much relief. Jadassohn recommends orgonin in a 1 to 2 per cent. solution, and speaks highly of its effectiveness and of its non-irritating qualities.

Pardoe recommends a 2 to 4 per cent. solution of silver nitrate solution as a prophylactic remedy. The application is made in the first twenty-four to forty-eight hours of the infection. In cases of long-standing he irrigates the urethra with permanganate of potassium. Pollard speaks favorably of protargol (5 to 10 per cent. solution) as a prophylactic remedy. Bierhoff injects into the bladder 150 c.c. of a 0.25 to 0.5 per cent. protargol solution. The solution is permitted to remain in the bladder until voided. Boldt introduces into the urethra a pledget of absorbent cotton saturated with a 10 per cent. solution of protargol. This application is left for fifteen minutes, when the cotton is removed. Bentler injects a solution of potassium permanganate (1 to 5000); this is voided and is followed by an injection into the bladder of a silver nitrate solution (1 to 1000).

When the acute stage has passed into the subacute and chronic stages, oleum santale or balsam of copaiba should be administered. The latter may be given in capsules of 15 grains each, three times daily. When there is pain on urination, archovin is said to afford much relief. This remedy produces an acid urine and has a sedative effect upon the mucosa of the urethra; 24 to 48 grains may be given daily in divided doses of 4 to 6 grains each. Gonosan is 80 per cent. sandalwood oil and 20 per cent. kava, soluble in ether, alcohol, or chloroform. Its effect upon the mucosa is to reduce the hyperemia and to anesthetize the sensitive surfaces, thereby relieving pain and diminishing the secretions.

That no one remedy has proved eminently satisfactory is evident from the large number of remedies advised, and the hopelessly divergent views of experts as to their proper application. In the chronic stage of gonorrheal urethritis the lesions are localized in one or more areas,

and should be treated with strong astringents and antiseptics, or by the cautery, through an endoscope. For this purpose a 20 per cent. to 50 per cent. silver nitrate solution may be employed, the applications being made with an applicator introduced through an endoscope.

Kelly advises the introduction of an endoscope to, but not beyond, the sphincter, and as it is slowly withdrawn the mucosa which folds into view is swabbed with a 5 per cent. silver nitrate solution. To lessen the pain the urethra may be first swabbed with a 10 per cent. solution of the hydrochlorate of cocaine. This may be done through an endoscope in the manner described above.

Special attention is to be given the orifices of Skene's glands when infected. Through a large, blunt hypodermic needle a 10 per cent. silver nitrate solution is injected into the lumen of the gland. In obstinate cases the gland should be incised throughout its entire length (one-half inch) by passing a fine probe into the gland and cutting down upon it. The exposed gland is then cauterized with a 10 per cent. solution of silver nitrate. The glands of Bartholin are treated in a similar manner.

The efficacy of gonococcic serums in the treatment of gonorrheal urethritis is as yet debatable. Perez-Miro has given intramuscular injections of gonococcic serum, and has observed an initial increase in the secretions, which is later followed by a gradual decrease. Herbst, on the other hand, has had no favorable results from such injections in the acute stage, and doubtful results in subacute and chronic cases. In contradiction to the findings of Herbst, Aronstam obtained positive results in acute cases and negative results in chronic cases.

Treatment of Subacute and Chronic Vulvovaginitis.—In the treatment of gonorrheal vaginitis the method in general practice consists in injecting a 1 to 10 per cent. solution of silver nitrate into the vagina, at intervals of two or three days. In infants this is best done by means of a catheter, and in adults, when ulcers exist, the cautery may be used to advantage, and to prevent cicatrization of the vaginal walls the vagina should be packed with iodoform gauze.

While nitrate of silver is unquestionably the most effective agency it may be very distressing. A good substitute, though not so effective, is protargol in a 10 per cent. to 20 per cent. solution. One or more daily vaginal douches of formalin (1 to 4000) or bichloride of mercury (1 to 2000) may be effectively applied.

In stubborn cases iodoform powder or aristol may be applied two or three times a week by dusting the powder thickly upon non-absorbent cotton or gauze, and tightly packing the vagina. These packs are removed in twenty-four to thirty-six hours, and are followed by formalin douches. All infected follicles should be incised and disinfected with pure formalin or burned with a galvanocautery.

In the management of acute vulvitis a weak solution of bichloride of mercury (1 to 1000 to 1 to 5000) should be used freely as a douche. Cotton may be saturated with a similar solution and applied several times a day. The patient should be confined to bed and laxatives administered as required.

When the *Bartholinean glands* are infected the most effective cure is found in the eradication of the gland. If this can be accomplished without rupturing the infected gland the wound can be closed with buried layers of catgut. When the wound is contaminated by the escape of pus the cavity should be lightly packed with iodoform gauze and allowed to heal by granulations. (For the treatment of vulvovaginitis in infants see page 536.)

Uterus.—*Acute Stage.*—Whether the infection is due to the gonococcus alone or to a combination of the gonococcus with the streptococcus, staphylococcus, or colon bacillus, non-interference should be enjoined through the acute stage of the infection. All intra-uterine manipulations are proscribed for fear of extending the infection to the tubes and of introducing a secondary infection. An indispensable factor in the treatment of these cases is *rest*, and to this end such cases are best treated in the hospital or at home under the care of a trained nurse.

Antiseptic vaginal douches will serve a useful purpose in maintaining cleanliness. The vaginal walls and vulva may become infected from the uterine secretions, and to avoid this, antiseptic vaginal douches should be given every four to eight hours. These douches may be of bichloride of mercury (1 to 2000) or formalin, 1 dram to 4 quarts of hot sterile water.

When all fever has subsided the douches should be given over a period of fifteen to twenty minutes and repeated four times a day. The vagina should be loosely packed with sterile absorbent cotton or gauze tampons soaked in a 7 per cent. ichthyol glycerin solution. These packs should be given every day or every other day. Six to eight hours is the usual period for the application of the packs. They should be preceded and followed by hot, antiseptic, vaginal douches.

No intra-uterine applications should be made until all signs of acute inflammation have passed. This period may be arbitrarily fixed at three weeks.

In the acute stage, sitz baths at a temperature of 70° F. may be given for a short period. An ice-bag should be placed over the hypogastrium and hot vaginal, bichloride douches should be given at low pressure.

Subacute and Chronic Stages.—After the acute stage has passed vaginal douches and glycerin-ichthyol tampons are to be supplemented by topical applications to the infected endometrium.

The author's preference is for a 30 to 50 per cent. zinc chloride solution. A general anesthetic is given and the cervix dilated. A 30 to 50 per cent. solution of zinc chloride is swabbed over the infected surface. This acts as an escharotic in destroying the superficially infected tissues, and has the advantage over the curet in not creating a wound. After an interval of ten days a 5 per cent. solution of zinc chloride should be injected through the cervix into the cavity of the uterus. But two or three drops of the solution should be injected. These treatments are repeated at intervals of ten to fourteen days. Not more

than six to eight injections should be made for fear of too great destruction of tissues.

To inject this fluid, the author uses a solid piston tonsillar syringe, with a long curved cannula of a caliber that will permit of easy introduction through the cervical canal without dilatation. No anesthetic is required.

The curet should never be used in the presence of a purulent leucorrhea, except for the control of hemorrhage.

Fig. 354

Injection of the urethra. Labia held apart by the left hand.

Throughout the course of the treatment bacteriological examinations of the cervical secretions should be made from time to time. By so doing one can judge of the progress of the case. A cure is pronounced only when repeated bacteriological tests give negative results.

When erosions of the cervix exist, these erosions should be painted with a 10 to 20 per cent. solution of silver nitrate or with a 10 to 20 per cent. solution of zinc chloride. These applications may be repeated once or twice a week. When there is a deep-seated infection of the vaginal portion of the cervix the most effective means of treatment is the amputation of the cervix.

Hysterectomy is advised when the uterus and its appendages are together involved. It is only when more conservative, tentative

measures have been given a full trial and have failed to give relief that such heroic measures should be adopted.

Fallopian Tubes.—*Acute Stage.*—During the acute stage the treatment is that of acute pelvic inflammation in general. During this period unnecessary examinations and manipulations are prohibited for fear of stripping the pus contents of the tubes into the pelvic cavity. In addition to rest, measures for the relief of pain and the depletion of the congested tissues, such as vaginal hot douches, glycerin tampons, and ice packs to the lower abdomen, are to be employed.

Chronic Stage.—Palliative treatment will forestall operative intervention in a large proportion of cases. The application of long-continued hot vaginal douches, of ichthyol and glycerin tampons, the regulation the bowels, and the avoidance of excessive exercise will often serve of to keep the patient in a fairly comfortable condition.

When the tubal infection continues to cause serious disturbances, and at intervals of weeks and months is awakened to acute exacerbations, operative measures should be resorted to. The removal of the tubes alone seldom results in complete relief. Nothing short of the complete extirpation of the uterus and infected tubes will promise an ultimate cure in a large proportion of cases. When possible the ovaries or a portion of them should be saved. The choice between a vaginal or an abdominal operation depends upon the extent of the adhesions. Vaginal drainage should be done when the tubes are distended with pus and can be readily reached per vaginam. For further discussion of the operative technic of inflammatory diseases of the tubes and ovaries see respective chapters.

Ovaries.—*Acute Stage.*—The management of acute ovaritis does not differ from that of acute metritis.

Chronic Stage.—The utmost conservatism should be exercised in the management of infected ovaries. The author questions, if in a young woman, it is ever necessary to remove all of both ovaries. Even when both ovaries are the seat of abscess formation, it is almost always possible to leave a portion of the abscess wall. All means should be used to conserve the ovaries. When these measures fail to give the desired relief, when the patient persists in her complaints of pain, conservative surgery must be invoked, but not the surgery that demands the sacrifice of both ovaries.

Rectum.—The infected rectum should be irrigated with normal salt solution. After cleansing it in this manner one of the various silver salts should be injected. For this purpose 20 per cent. protargol or 40 per cent. argyrol solution may be used. In stubborn cases a stronger solution may be used as a swab. Fissures and ulcerations should be treated with the Paquelin cautery.

Bladder.—In the acute stage of gonorrheal cystitis internal medication is of value. Urotropin in 7-grain doses should be given four to six times a day, and to this 5 grains of salol may be added. Benzoic acid in 10-grain doses, given three times a day, will act as an antiseptic in the bladder. The following prescription is advised by Bandler:

℞—Extract hyoscyam. . . . . gr. ss 0.037
Salol . . . . . gr. v 0.325
Urotropin . . . . . gr. v 0.325
F. tal. capsulæ, no. xx.
Sig.—One every three hours with water.

For relief from pain, sitz baths and hot fomentations are of value, but it may become necessary to resort to hypodermic injections of morphine. A moderate sedative to the bladder is found in a combination of the extracts of opium and hyoscyamus, each 1 grain, given as required. Rectal suppositories of opium and belladonna will afford relief from pain.

The local treatment of acute cystitis is of importance. The bladder should first be irrigated with sterile normal salt solution or a 1 per cent. boracic acid solution. A non-irritating silver solution should be injected into the bladder immediately following the irrigation. Protargol (1 to 500) may be used for this purpose. If the results are not satisfactory, a solution of silver nitrate (1 to 5000) may be injected in quantities of 2 to 6 ounces and allowed to remain ten or more minutes within the bladder. The strength of the silver solution may be increased to 1 to 500 in stubborn cases. Rest in bed is of the utmost importance. An ice-bag may be applied over the hypogastrium, and short, cold vaginal douches given two to four times daily. Large quantities of milk and water should be drunk. A liquid diet, together with fruits, is advised. All red meats, alcoholic beverages, and condiments should be avoided.

A long list of drugs has been recommended for the treatment of acute cystitis, such as oil of sandalwood, copaiba, and sweet spirits of nitre. Some virtue may be ascribed to them, but they are one and all more or less disturbing to the stomach and unreliable.

In the chronic stages of cystitis local applications are advised. No drug is so effective or in so general use as the nitrate of silver, injected into the bladder in a solution of 1 to 2000 and retained for twenty to thirty minutes and then voided. The solution may be gradually increased in strength to 1 to 100 when it is well borne. The bladder should be first irrigated with a boracic acid solution before applying the silver nitrate. It is not always possible to get results from any one line of treatment conducted for a considerable time, hence the advisability of resorting to other medicaments when progress is not satisfactory.

Topical treatments, made by an applicator inserted into the bladder through an endoscope, will often accomplish the desired results when instillations and irrigations fail. Silver nitrate, in a 10 to 20 per cent. solution, may be thus applied once or twice a week, the application being made direct to the affected area.

Finally, if all topical applications fail, the surgeon may put the bladder and urethra at rest and establish free drainage by making vesicovaginal drainage through an artificial fistula.

GONORRHEA IN CHILDREN

Etiology.—Gonorrhea in children usually arises from contact with soiled linen and sponges. In children's wards the infection may be carried on thermometers and fingers of nurses, who go from one child to another without taking the precaution to thoroughly cleanse their hands and thermometers. Children have been known to become infected when sleeping with an infected mother or nurse. Unjust accusations have been made through ignorance of the fact that gonorrhea in children is not infrequently the result of accidental contamination. That the bath may convey the infection is illustrated by a report from Welt-Kakels, who referred to an instance occurring in Pose, Germany, where 236 school girls acquired vulvovaginitis from a common bath. Kelly says that girls are infected intentionally through a somewhat prevailing superstition among the lower classes that the disease can be eradicated if it is transferred to a healthy person, notably a virgin.

Vulvovaginitis.—According to most authorities vulvovaginitis exists in about 1 per cent. of female children, and that the great majority of these cases are gonorrheal. It is the exception that a purulent vaginal discharge in children is due to causes other than gonorrheal. The vulva and vagina of adults are not easily infected because of the presence of multiple layers of fat epithelium arranged in palisade form. In children these structures are covered with delicate epithelium, which affords little protection against invading gonococci; hence the frequency with which vulvovaginitis is found in children. The gonococci pass between the epithelial cells, and are known to pass beyond the epithelium into the subepithelial tissue.

Vulvovaginitis in children, in the acute stage of the infection, does not differ essentially from that found in adult life. The labia are swollen, red, and edematous. The hymen and inner surfaces of the labia are sites of predilection, and the inflammation may extend to the perineum and neighboring skin surfaces. Condylomata may cover the vulvar and peritoneal surfaces and the region about the anus, though this is exceptional. The infected surfaces are usually covered with a greenish or yellowish discharge. The infection may end here, but, as a rule, the vagina is invaded.

The recognition of an existing vaginitis is not difficult. After cleansing the vulvar surfaces, pus may be seen to exude through the opening of the hymen, or a very small speculum may be passed into the vagina, though this latter procedure is open to the serious objection that the disease may thereby be conveyed from the vulva to the vagina. Certain so-called congenital anomalies may be ascribed to gonorrhea acquired *in utero*, *i. e.*, imperforate hymen, adhesions of the labia and prepuce, diseased and malformed uteri, and Fallopian tubes. The urethra is frequently the seat of gonorrhea, but the author knows of only one reported case in which the infection extended to the bladder, that of Wertheim, who found gonococci in the epithelial interspaces of the

bladder, in the wall of the bladder, and within the bloodvessels of the bladder wall.

In rare cases the infection may extend from the cervix to the body of the uterus, thence to the tubes, ovaries, and pelvic peritoneum. Goodman reported eight cases of gonorrheal general peritonitis, with two fatalities. The favorable prognosis of gonorrheal peritonitis is worthy of note. The pathological lesions and clinical manifestations do not differ from those found in adult life. Bandler observes that children suffering from pelvic or general gonorrheal peritonitis are commonly assumed to have appendicitis, but the presence of a gonorrheal vulvovaginitis should lead to a correct diagnosis.

Proctitis occasionally accompanies a vulvovaginitis and is recognized by itching and irritation about the anus, a purulent discharge from the rectum, and the detection of gonococci in the discharge. Occasionally ulcers are developed on the rectal mucosa. These ulcers may give rise to a bloody discharge from the rectum and to painful stools.

Treatment.—Since the infection is most frequently conveyed by napkins, it follows that all napkins worn by infected children should be burned, and all linen should be soaked in an antiseptic solution, then washed and sterilized. In cleansing the infected parts absorbent cotton should be used in place of sponges. Baths should not be given in tubs shared by other patients and healthy individuals. Strict isolation of these cases should be maintained in hospitals, hence they are not to be cared for in wards. This quarantine should embrace the nurse in attendance if further spread of the disease is to be prevented. The quarantine should not be raised as soon as the local signs of inflammation subside, but should continue so long as the presence of gonococci can be demonstrated in the secretions.

Bandler recommends painting the vulva with a 10 per cent. solution of silver nitrate. Not only the vulva but the surrounding skin surfaces should be treated in like manner. Warm sitz baths should be given once or twice daily. When there is much irritation the surfaces should be anointed with a 2 per cent. protargol ointment. Similar remedies may be employed in the treatment of gonorrheal infection of the rectum. Fissures and ulcers should be cauterized by the Paquelin cautery. It is essential to enjoin rest in bed in all these cases throughout the acute stage.

Butler and Long, of Chicago,[1] in making a report of their clinical observations with gonorrheal vaccine in the treatment of vulvovaginitis in children, say:

"The contention might be raised that gonorrhea is aggravated in female children by local treatment and that the discontinuance of such treatment might be expected to be followed by betterment. The possibility of this should be conceded, but when we are able to trace daily variation in the clinical manifestations with the ebb and flow of the wave of immunity, when we see within twenty-four hours a

[1] Jour. Amer. Med. Assoc., March 7, 1908.

profuse discharge cease and find negative smears coincident with a marked rise in the opsonic index, the above contention loses much of its weight, and in the cases treated must be excluded from consideration in calculating results.

"If from our work any conclusions are permissible, we believe it no exaggeration to state that vaccine therapy has a place in the treatment of gonorrhea in the female, that it appears to be far more efficient, and at the same time scientifically more tenable than local antiseptic treatment."

While a vulvovaginitis usually disappears with six to twelve weeks' of careful treatment, exacerbations are often observed. One case is recorded where the disease lasted four years.

CHAPTER XXIV

TUBERCULOSIS OF THE GENITAL ORGANS

Etiology
1. Primary Infection
2. Secondary Infection
Tuberculosis of the Vulva and Vagina
Tuberculosis of the Cervix
Tuberculosis of the Uterus
Tuberculosis of the Ovaries
Tuberculosis of the Fallopian Tubes
Tuberculous Peritonitis
Prognosis
Treatment

Etiology.—While the knowledge of the existence of genital tuberculosis in women dates to the middle of the eighteenth century, and an accurate and exhaustive contribution on the pathogenesis, diagnosis, and surgical treatment was presented by Hegar as early as 1886, yet it may be stated that the profession in general fails to appreciate the prevalence of the disease.

Essential Causes.—The essential cause of tuberculosis of the genital organs is the tubercle bacillus of Koch, which is conveyed to the genital organs either directly by hands, instruments, or coitus, or indirectly by way of the bloodvessels and lymphatics from neighboring and distant portions of the body.

Predisposing Causes.—As predisposing causes to tuberculosis of the genital organs, Hegar mentions general and local malnutrition, hypoplasia, and other developmental anomalies of the genital organs, puerperal and gonorrheal infections, syphilis and childbearing.

Age.—Genital tuberculosis has been found at all periods of life. Feise and Schmorl found tubercles in the genitals of a fetus. A number of cases have been reported in ages ranging from birth to eleven years. More than 50 per cent. of all cases occur before thirty years of age and a goodly proportion develop in childhood. Still estimates that 9.5 per cent. of tuberculous girls under twelve years of age have genital tuberculosis. It is exceptional to find tuberculosis developing in the genital organs after forty years of age.

Frequency.—About 10 per cent. of all forms of salpingitis are tuberculous. In 795 autopsies performed by Berkeley on tuberculous cases 62 showed genital tuberculosis. The proportion of women suffering from pulmonary tuberculosis who have genital tuberculosis is variously estimated at 6 to 12 per cent. In 955 autopsies on women who died of pulmonary tuberculosis, the lesion was found in the genital organs in 14.7 per cent. (Turner).

Schlimpert finds about 2 per cent. of genital tuberculosis in his autopsies on women. In every instance there were active or latent foci elsewhere in the body. He demonstrated that the infection was conveyed by way of the blood stream in nearly every instance.

In all Schlimpert found 73 cases of genital tuberculosis with the following organs involved: Uterus, 41 times; cervix, 3 times; vagina, 7 times; tubes, 51 times; ovaries, 10 times. In about one-half the cases the peritoneum was involved.

Genital tuberculosis occurs about five times as frequently in the female as in the male. Amann estimates that 3 per cent. of tuberculous lesions involve the genital organs of the male as compared with 20 per cent. in the female.

Primary infection of the genital organs is rare, though it is possible for the vulva, vagina, cervix, uterus, tubes, and ovaries to be the primary seat of infection. Tubercle bacilli may be conveyed direct to these organs by the examining finger, by instruments, and by coitus with a tuberculous male. It is not essential that the male genitals be tuberculous in order that the husband may transmit the disease to the genitals of the wife. Tubercle bacilli have been found in the semen of men whose genitals were free of tuberculosis but whose lungs or intestines were infected. In children the bacilli have been conveyed to the genitals from infected stools and from soiled linen.

Without a postmortem examination of all organs, it is not possible to speak with full assurance of a primary lesion in the genital organs. A clinical examination, however searching, may fail to disclose a latent primary focus in the lungs, intestines, bones, mesenteric glands, and elsewhere.

Secondary infection of the genital organs is not uncommon when tuberculous foci exist in adjacent or remote regions of the body. From adjacent structures we find tuberculosis extending from the peritoneum to the tubes and ovaries and downward to the uterus, cervix, vagina, and vulva. Again, the infection is conveyed by blood and lymph vessels from the lungs, mesenteric glands, intestines, and bladder to the genital organs.

We will here discuss ascending and descending forms of genital tuberculosis.

Ascending tuberculosis is observed in a small percentage of cases. The infection in rare instances begins in the lower genital tract and travels upward through the uterus to the tubes, ovaries, and peritoneum.

Descending tuberculosis is by far the most common. The lesion may begin in the peritoneum and extend to the ovaries and tubes and downward to the uterus, cervix, vagina, and vulva, though, as a rule, the disease does not extend lower than the uterus.

Tuberculosis of the Vulva and Vagina.—Primary tuberculosis of the vulva and vagina is rare, but possible. The lesion is almost invariably secondary to tuberculosis in the tubes, and back of this there is usually a primary focus in the lungs or some other remote organ. The lesion is easily confounded with lupus, rodent ulcer, esthiomene, cancer, syphilis, and phagedena. (See Chapter XVII.) Beyea reported 69 cases of tuberculosis of the cervix, 19 of this number being limited to the portio vaginalis and 6 to the cervical canal, and in the remaining 44 both portions of the cervix were involved.

Tuberculosis of the Cervix.—It is doubtful if tuberculosis ever exists as an isolated lesion in the cervix. It is easily confounded with carcinoma and syphilis. Tuberculosis is seldom found to coexist in the body of the uterus and cervix. The tubes and cervix may be involved and the uterus remain free of infection.

Tuberculosis of the Uterus.—Next to the tubes the uterus is most often involved. In 172 cases of genital tuberculosis reported by Merlette the uterus was involved 75 times. Palano reports cases ranging in age from nine and a half months to sixty-four years. 83 per cent. of all cases tabulated by Palano dated back to childbirth. Tuberculous metritis is not incompatible with pregnancy, but pregnancy will commonly cause a preëxisting tuberculous lesion to become active and to spread to adjacent and remote tissues. The tuberculous lesion is commonly confined to the endometrium, though the musculature is known to be invaded, particularly in childhood.

The question is raised as to whether tuberculosis is ever primary in the endometrium. While it is possible, the rule is that the endometrium is invaded from the tubes.

Doederlein recognized three types of tuberculous endometritis, the miliary, interstitial, and ulcerative. (See page 423.)

Tuberculosis of the Ovaries.—In nearly every instance the ovary is infected by the tubercle bacillus secondary to the Fallopian tubes or peritoneum. Wolff finds that 60 per cent. of all cases of tuberculous ovaries are associated with tuberculosis of the tubes or peritoneum. Instances are recorded in which the ovary was the only pelvic organ involved, but in all cases there was a remote primary focus. The ovary is involved in one-third of all cases of genital tuberculosis, and in more than half the cases the lesion is bilateral. It must be borne in mind that miliary tubercles may be scattered throughout the ovary without appearing on the external surface, so that it is possible to overlook the lesion, even with the abdomen open. Without a microscopic and bacteriological examination the lesion may not be recognized. (For the pathology and diagnosis of tuberculous ovaritis see above.)

Tuberculosis of the Fallopian Tubes.—While the Fallopian tubes are the most frequent seat of genital tuberculosis the lesion is seldom confined to the tubes, but invades adjacent structures.

In a small percentage of cases tuberculous salpingitis is primary, but in nearly every instance tuberculous foci are found elsewhere in the body, and the infection of the tubes is the result of direct extension from surrounding structures or the bacilli are conveyed from the primary focus in remote organs by way of the blood or lymph.

Frequency of Tuberculous Salpingitis.—The tubes are involved in about 90 per cent. of all cases of genital tuberculosis, and the infection is confined to the tubes in about one-fourth of this number. In 4470 autopsies performed on women by Schraum, Frerichs, and von Rosthorn, tuberculous salpingitis was found 53 times. In 814 cases of salpingitis (Williams, Martin, von Rosthorn), tuberculosis was found 29 times.

In 17,470 autopsies on women performed in the German clinics

tuberculosis of the tubes was found in 142 cases, or 1 in 123. About 1 per cent. of all female cadavers have tuberculosis in the tubes. In a total of 884 observations made by Williams, Martin, Menge, and von Rosthorn there was an average of 6.2 per cent. of tuberculosis found in all forms of salpingitis.

Age of Appearance.—No age is exempt. It has been found *in utero* at seven months and at the age of seventy-nine years. The most susceptible period is between twenty and thirty years of age, though the period of ten to twenty and thirty to forty are but little less susceptible. It is rare that the disease occurs after forty years of age.

Avenues of Invasion.—The tube is invaded by:

1. Continuity of tissues (peritoneum, uterus, vagina, bowel, and bladder).

2. Bloodvessels and lymph vessels. More often the lungs are the primary seat of infection.

Why are the Fallopian tubes more liable to tuberculosis than the other genital organs?

Hegar and Sippel offer the explanation that the irregularities in the mucosa of the tubes favor the lodgement of tubercle bacilli. Amann further adds the theory that the convolutions of the tubes and the impoverished blood supply favor the invasion of tubercle bacilli. Gonorrheal infection of the tubes will doubtless lower the resistance of the tissues and render them more susceptible to tuberculosis.

Pathology and Diagnosis.—(See page 541.)

Treatment of Genital Tuberculosis.—The question of operative interference naturally arises in a discussion of the treatment of genital tuberculosis. In deciding this question, inquiry must be made (1) as to whether genital tuberculosis leads directly to a fatal issue, and (2) as to whether genital tuberculosis leads to invalidism.

Is genital tuberculosis a direct cause of death?

A survey of the literature convinces the author that death is rarely attributed directly to genital tuberculosis. Simmonds, of Hamburg, has never observed a death which he could ascribe to genital tuberculosis. Schmorl and Schlimpert report 144 autopsies in which genital tuberculosis was found, and in none of these cases was the death directly caused by the pelvic lesion, though in two instances the pelvic lesion was a contributing factor.

It follows that there is seldom if ever a vital indication for operative interference in genital tuberculosis.

The second question is not so easily disposed of.

Does the genital tuberculosis produce symptoms which justify operative interference?

We have the authority of Doederlein and Kroenig that genital tuberculosis rarely gives rise to a miliary tuberculosis and that ulceration seldom develops between the genital tract and the bladder or rectum. There is much difference of opinion as to the frequency of the development of general tuberculous peritonitis from a primary focus in the genital organs. There is an evident lack of harmony in the views of

anatomists and clinicians on this important point. Schickele, of Freiburg, finds but little tendency in this direction. The prevailing impression among clinicians appears to be that there is liability of spreading the infection from the uterine appendages to the peritoneum.

In considering this point it must be borne in mind that genital tuberculosis is rarely primary; that in the great majority of cases the primary lesion is in the lungs or intestines. It is therefore manifestly difficult to judge the symptom-complex and determine with certainty what should be credited to the lesion in the lung or bowel and what to the genital organs.

Symptoms directly due to genital tuberculosis are seldom severe and can usually be relieved by palliative measures. The paroxysmal pains give way to rest and the application of heat. The hemorrhages, which occur in but a small percentage of cases, are in reality the only urgent indication for operative interference. In tuberculous endometritis, Hegar advises curettage of the uterus, but Schauta and Pozzi believe curettage to be merely a palliative measure in temporarily checking the bleeding. They argue that curettage is not a harmless procedure because of the danger of spreading the infection, of adding a secondary type of infection, and of awakening a latent infection in the lungs or elsewhere.

The conclusion is forced upon us that a radical operation is rarely justified for relief from symptoms caused by genital tuberculosis. This is so because:

1. The symptoms directly referable to genital tuberculosis are rarely severe and will usually yield to palliative measures.

2. Operative measures may cause an awakening of a latent primary focus and result in a local or general dissemination of the infection.

3. There is a relatively high primary mortality in these operations. Doederlein's estimate is 10 per cent.

4. Since genital tuberculosis occurs with greatest frequency in girlhood and early womanhood, and the tuberculous lesion is seldom confined to one portion of the genital tract, operative interference may result in an unwanton sacrifice of organs.

5. There is a marked tendency toward self-limitation and spontaneous healing in genital tuberculosis.

To what extent should the operation be carried?

Inasmuch as the tubes are almost always the primary seat of infection, so far as concerns the genital organs, the rule is generally followed to remove only the tubes. Both tubes are involved in about 90 per cent. of cases.

The ovaries are only removed when there are evident tuberculous lesions in the ovaries. It is questionable if both ovaries should be removed in young women unless the disease is far advanced.

The uterus should be removed when infected if the patient is advanced in years and if there is uncontrollable bleeding.

In tuberculosis of the cervix, unaccompanied by an involvement

of the upper genital tract, a high amputation of the cervix should be made.

In tuberculosis of the vulva and vagina, ulcers may be cauterized or excised and papillary growths may be removed, though here the *x*-rays are of special value.

Tuberculous Peritonitis.—According to Nothnagel 90 per cent. of tuberculous peritonitis is found in the female. In former years tuberculous peritonitis was believed to be almost uniformly fatal. In recent literature we find contradictory views expressed. Some would have it that the disease is largely amenable to surgery; others that the indications for operative interference are necessarily restricted to a small percentage of cases.

Indications for Treatment.—The purpose of treatment, according to Murphy, is fourfold:

1. To remove the source of supply to the peritoneum.
2. To remove from the peritoneum the products of the infective process.
3. To increase tissue resistance for the purpose of encapsulating the remaining tuberculous foci.
4. To avoid mixed infection.

What is the cause of death in tuberculous peritonitis?

Death may result from:

1. Mechanical ileus due to adhesions.
2. Toxic absorption.
3. Rupture of tuberculous ulcers of the bowel into the free peritoneal cavity.

Postmortem observations reveal that the cause of death in 90 per cent. of cases is due to the primary focus in the lungs, meninges, or to general miliary distribution. When possible the primary focus (tubes, appendix) should be removed; this will increase the percentage of cures and decrease the percentage of recurrences. The fimbriated end of a tuberculous tube usually remains open, and so long as this condition prevails the peritoneum is continually supplied with fresh tuberculous material. Furthermore, the tuberculous lesion in the mucosa of the tubes is slow to heal. For these reasons the infected tubes should be removed when found in the presence of a tuberculous involvement of the peritoneum.

Abdominal Section.—The percentage of cures following abdominal section for tuberculous peritonitis is recorded by Koenig as 65 per cent., Margarucci as 85 per cent., Roersch as 70 per cent., and Wunderlich as 20 per cent. The difference in results is largely accounted for by the difference in indications for operative interference.

Some would operate only in the exudative type, while others would include the adhesive and ulcerative types. Again, there are surgeons who will not open the abdomen in the presence of an active focus in the lung or elsewhere, while others will disregard such complications. Then, too, in the making of statistics some operators include all deaths: those due directly to tuberculous peritonitis and those due to tuber-

culosis of other regions. The only reliable statistics are those based upon a pathological classification.

To what extent does tuberculous peritonitis affect the health of the individual?

Doederlein believes that a large percentage are not seriously affected. He says that fully 50 per cent. of the women who enter his clinic with tuberculous peritonitis, and are subsequently operated upon, complain of sterility and have little or no distress in the abdomen. Some complain only of backache and others of a large abdomen. Few suffer from severe pain or hemorrhage.

Of those who are seriously debilitated, and they constitute the other 50 per cent. of cases, the debility is largely attributable to the primary focus in the lungs or bowel rather than to the peritoneum or pelvic organs.

Primary Mortality of Abdominal Section.—The primary mortality of abdominal section for tuberculous peritonitis is relatively high. Kroenig gives 3 per cent., Lindner 7.5 per cent., and Doederlein 12 per cent.

The following rules will govern abdominal section for tuberculous peritonitis:

1. Operate in only the exudative type. The adhesive and ulcerative types are not favorable subjects for operation.

2. Do not operate in the presence of a fever or when there is an active focus of tuberculosis in the body.

Borchgrevink recommends medical treatment in tuberculous peritonitis. He says that when peritoneal tuberculosis exists without fever the disease will usually run a favorable course and does not require a laparotomy.

Medical Treatment.—Medical treatment of tuberculous peritonitis is the same as that employed in the management of tuberculosis of the lungs. Good food and fresh air are essential. Such tonics as cod-liver oil do not in the least supersede fresh air and an abundance of nourishing food. No medicine should be given that will disturb the stomach and interfere with the ingestion of food.

Tuberculin has been extolled, but it is not clear that its value is great as a curative agent. Cures by the administration of tuberculin have been reported by Gray, Rumph, McCall, Leser, Kummel, and Riegel. Von Ruck gives encouraging reports, having a record of 3 cures in 4 cases; 82.3 per cent. of Borchgrevink's cases were cured by medicinal means.

Johnston in a review of the statistics says: "By comparing the statistical results of cases that have been observed for a sufficient time after treatment, one is impressed with the fact that the figures are about the same in those treated surgically as in those treated by medicinal means, and one may conclude that the prognosis for recovery is good in one-fourth to one-third of all cases of tuberculosis of the peritoneum."

CHAPTER XXV

NUTRITIONAL DISTURBANCES OF THE GENITAL ORGANS

Retrogressive Tissue Changes
- Atrophy of the Vulva (Kraurosis Vulvæ)
- Atrophy of the Vagina
- Atrophy of the Uterus
  - Physiological Atrophy
  - Superinvolution of the Uterus
- Atrophy of the Ovary

Progressive Tissue Changes
- Elephantiasis Vulvæ
- Condyloma Acuminata
- Hypertrophy of the Vulva
  - Hypertrophy of the Clitoris
  - Hypertrophy of the Labia
- Hypertrophy of the Cervix
  - Supravaginal Hypertrophy
  - Infravaginal Hypertrophy
- Subinvolution of the Uterus
- Hypertrophy of the Ovary

There are found throughout the genital tract certain nutritional disturbances which cannot be grouped with inflammations or tumor formations, and so for convenience are incorporated in a separate chapter. These nutritional changes may be classified as retrogressive and progressive tissue changes.

RETROGRESSIVE TISSUE CHANGES

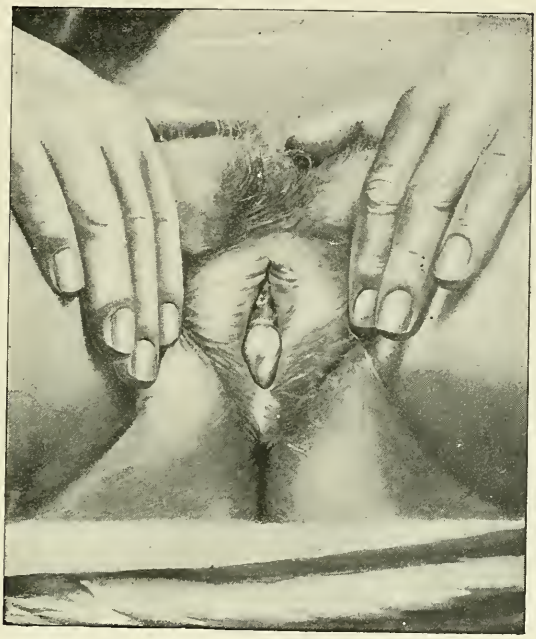
Atrophy of the Vulva (Kraurosis Vulvæ).—After the menopause there occurs a physiological atrophy of the vulva in which the labia majora lose their plumpness, the labia minora diminish in size and may wholly disappear, the clitoris is shortened, the mucous membrane becomes dry and pale, and the vulvar orifice is narrowed.

Kraurosis vulvæ is a term applied to a specific form of atrophy of the vulva, the cause of which is not known. The extent of the atrophy may be greater than that found in old age. The labia majora are flat and flaccid; while the mucosa may be so friable as to be injured by the examining finger. The labia minora and clitoris may wholly disappear. In addition to the dryness of the surface there is extreme sensitiveness. Dyspareunia is a common complaint, and when associated with itching and a sense of dryness in the vulva, the possibility of kraurosis is to be borne in mind (Fig. 355).

Kraurosis occurs chiefly in women of advanced age; in women who have borne children and have become sterile; in the married and in the widow. The lesion sometimes follows removal of the ovaries. That it is due to syphilis and gonorrhea is quite improbable. The lesion is probably of inflammatory origin. The glandular structures

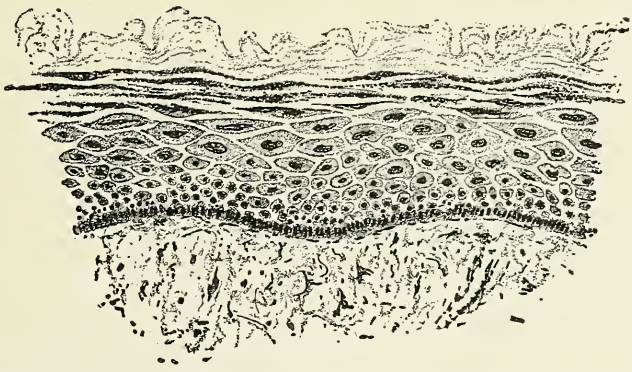
of the affected area disappear; the papillæ are poorly developed, and the corium is atrophied.

Fig. 355



Kraurosis vulvæ. Clitoris and labia minora completely atrophied; the labia majora flattened and wrinkled. (Gerhard.)

Fig. 356



Kraurosis vulvæ. Marked hornification of the corium, with round-cell infiltration; papillæ are absent. (Gerhard.)

Palliative Treatment.—The pain, pruritus, and burning of kraurosis vulvæ demand relief so far as may be given. Local applications afford only temporary relief, if any. Relief may be afforded for some time by the application of a 10 per cent. solution of nitrate of silver or of pure

carbolic acid. Hot fomentations are soothing. The vulva should be kept smeared with a 3 per cent. carbolo-salve; this protects the surface from the irritating influences of the urine. A gauze pad soaked in a saturated solution of the acetate of lead will afford some relief.

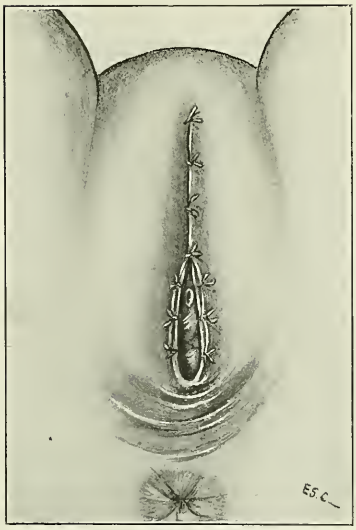
Fig. 357

Kraurosis vulvæ.

Fig. 358

Removal of area involved in kraurosis vulvæ. Dotted lines represent area of denudation.

Fig. 359



Margins of denuded area approximated.

Operative Treatment.—When palliative measures fail, relief can only be obtained through operative interference. A forcible stretching of the vulvar outlet will sometimes give relief for a considerable period, but permanent relief can only come from excision of the affected skin surface.

Technic of Operation.—An incision is made with the knife 2 cm. outside the involved area. The skin is dissected off and the margins approximated with interrupted silkworm-gut sutures.

When the greater portion of the vulva is involved the typical operation is carried out as illustrated in Figs. 357, 358, and 359.

Atrophy of the Vagina.—(See Atresia of the Vagina, Senile Vaginitis, page 409.)

Atrophy of the Uterus.—Physiological Atrophy.—Physiological atrophy of the uterus follows the menopause. Similar changes in the uterus follow the removal of the ovaries.

Superinvolution of the Uterus.—(Secondary Atrophy, Puerperal Atrophy, Lactation Atrophy.)—In this condition the puerperal uterus has involuted beyond the normal limits and may be reduced to one-half or one-third the normal size. As a rule, the tubes and ovaries share in the atrophic changes.

Etiology.—

1. Postpartum and postabortive hemorrhages.
2. Puerperal sepsis.
3. Prolonged lactation.
4. Wasting diseases complicating the puerperium.

Secondary atrophy of the uterus and ovaries may be due to constitutional disturbances, leading to malnutrition or to indefinite embryological disturbances. Not infrequently these conditions can be traced to the diseases of childhood, notably scarlet fever, measles, mumps, and diphtheria. When the development of the ovaries is checked, there must of necessity follow atrophic changes in the uterus and tubes. This is so because the internal secretion of the ovary is essential to the development of these organs.

Chlorosis is believed by many to be associated with a faulty secretion of the ovaries. This theory finds support in the fact that chlorosis occurs exclusively in girls at an age corresponding to their sexual development, between the ages of twelve and twenty. Von Noorden advances the theory that the internal secretion of the ovary stimulates the blood-forming centres, and when this secretion is lacking there is an underdevelopment of blood. In further support of von Noorden's theory is the common finding of poorly developed genital organs in chlorotic girls. About 75 per cent. of chlorotic girls suffer from a partial or complete loss of their menstrual functions. They usually menstruate early rather than late in life.

Obesity may be associated with underdevelopment of the ovaries, tubes, and uterus, and hence with a faulty functionating capacity of these organs. The tendency to lay on fat is probably secondary to the atrophic changes in the ovaries, and suggests the tendency of women to increase in weight after the menopause. Associated with the loss of ovarian secretion is the loss of the thyroid secretion, as has been frequently demonstrated.

Symptoms.—

1. Amenorrhea.
2. Sterility.
3. Nervous disorders.

The patient either fails to resume the menstrual functions or menstruates but little, depending upon the degree of atrophy. Unless the atrophy is checked before the atrophic changes become pronounced

the capacity for childbearing will be lost. Such individuals are usually classed as neurotics. They complain of general debility, headaches, lumbosacral pains, and gastro-intestinal disturbances.

Diagnosis.—The diagnosis is suggested by the history. When the patient has been perfectly regular in her menstrual history, has given birth to a child, and one or more of the above causal factors have been interjected, and following childbirth the physiological period of lactation is prolonged beyond the usual period, the presumption is that the uterus has involuted beyond the normal limits. The diagnosis is confirmed by a bimanual examination and by the passage of a sound into the uterus. If the uterine cavity is less than two and a half inches in depth the diagnosis of superinvolution is established. If the cervix is inspected through a speculum and is found smaller than normal, it is assumed that the body of the uterus is correspondingly small, though this is not always the case.

Prognosis.—A moderate degree of atrophy may be corrected by increasing the nutrition of the patient, but a well-advanced atrophy cannot be remedied.

Treatment.—*General Treatment.*—Whatever will improve the general nutrition will tend to develop the uterus. A nutritious diet, exercise in the open air, indoor gymnastics, cold baths, are all of value. Tonics of iron and arsenic, such as Blaud's pill and Fowler's solution, may be indicated.

Local Treatment.—The pelvic circulation may be stimulated by massage and short, hot douches. The wearing of a stem pessary is also recommended.

Atrophy of the Ovary.—The physiological atrophy of the ovary in the climacteric may occur some time before the menstrual periods altogether cease, or may be delayed many years. Atrophy of the ovary usually precedes the menopause by a year or more, but is seldom complete for several years after the menopause.

A pathological atrophy of the ovary results from interference with the nutrition of the organ and from direct and continuous pressure upon the ovary by tumor formations and inflammatory exudates. Inflammatory adhesions may contract about the ovary and tube, limiting the blood supply and bringing on atrophy. Swellings of the tubes, uterus, and ovaries may cause pressure atrophy. Atrophy of the ovary may follow the infectious and contagious diseases, syphilis, diabetes, the primary and secondary anemias, myxedema, morbus Basedowii, tabes dorsalis, acromegaly, and poisoning by arsenic and phosphorus.

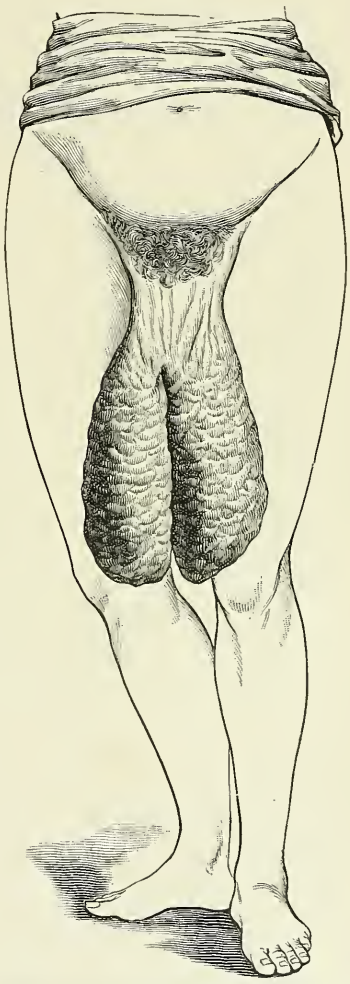
Varicosities of the veins of the mesovarium have been reported by Palmer Dudley as being responsible for atrophy of the ovary. Martin, in his report of 40 cases, takes the position that the majority of women with atrophied ovaries suffer from pulmonary tuberculosis.

The menstrual functions become less active as the atrophy of the ovaries progresses. The individual often increases in weight. Nervous disturbances are frequently complained of, such as pain and throbbing in the head, flashes of heat and cold, insomnia, irritability of temper,

and despondency. A positive diagnosis is reserved until direct inspection of the ovaries can be made. Atrophy, together with cystic degeneration, frequently explains the early occurrence of the menopause.

Treatment.—The author knows of no treatment that will correct the atrophic changes in the ovaries, but there is in the corpus luteum extract a remedy that will, in a measure, afford a substitute for the diminished ovarian secretions, and in this way will help to control the nervous phenomena incident to the loss of ovarian function.

Fig. 360



Elephantiasis of the vulva. (Bonnet and Pettit.)

PROGRESSIVE TISSUE CHANGES

Elephantiasis Vulvæ.—In the early stage of development the growth is not unlike simple hypertrophy, but as it progresses it tends to become more and more pedunculated and may extend to the knees, weighing several pounds. When the surface is smooth it is known as elephantiasis glabra; when nodular, elephantiasis tuberculosa, and when covered with warty excrescences, elephantiasis condylomata. The surface may be more or less ulcerated (Fig. 362).

The point of origin may be the labia majora, labia minora, mons veneris, or clitoris. It is unusual for the growth to arise simultaneously from two or more of these surfaces.

The greater portion of the growth is of connective tissue, with edematous infiltration of the connective-tissue spaces. There is a scant blood-supply to these growths.

The essential cause is the filaria sanguinis hominis. Elephantiasis sometimes arises from the base of old ulcers and suppurating buboes. Stenosis or occlusion of the lymph channels is undoubtedly an underlying factor, but the cause of obstruction to the lymph channel is unknown. The patient consults the physician because of the weight of the growth and its interference with walking and coition.

Diagnosis.—The diagnosis will involve little difficulty. It is distinguished from carcinoma by the absence of friability, the slow growth, and, finally, by a microscopic section showing an absence of epithelial

invasion of the connective tissue and the presence of connective-tissue hyperplasia. There are no constitutional effects.

Treatment.—The treatment is both medical and surgical.

Medical Treatment.—It is only in the acute stage that medical treatment will avail anything. At this time the patient should be kept in bed and hot fomentations applied to the affected parts. The application of gauze, saturated in a lead-water and laudanum solution, will help to allay the acute inflammation. When the inflammation has subsided to a degree, mercurial ointment should be applied daily. The iodide of potassium or sodium may be given internally. Throughout the acute and subacute stages, a soft but firm compress of gauze should be applied to the vulva and supported by a T-binder. The *x*-rays have been used with good results in the chronic stage.

Surgical Treatment.—When the disease has advanced to the chronic stage and has attained considerable proportions surgery may be invoked. The hypertrophied parts should be excised.

Condyloma Acuminata.—Of the hypertrophic lesions due to inflammation, the most common are the condylomata acuminata, which are almost invariably of gonorrheal origin. Dr. Richard R. Smith reported an advanced case in a child, aged nineteen months (Fig. 361). R. L. Dickinson in discussing "Hypertrophies of the Labia Minora and Their Significance," reported 373 cases, and gave as his conviction that all were due to the habit of masturbating.[1]

The development of condylomata is particularly rapid during pregnancy, and is said to be caused by the irritating vaginal discharge. In the early stage of the development these warty outgrowths are pale red or gray. Later the papillary projections become confluent and may assume the proportions of a man's fist. Occasionally the growth is pedunculated. They are found distributed over part or all of the vulva, vagina, and the neighboring skin surface of the mons veneris, groin, buttocks, and perineum. The lesion is essentially an overgrowth of the papillæ. The greater part of the growth is due to an increase in the epithelial covering of the papillæ. In general appearance such a growth is not unlike a cauliflower carcinoma. The distinction is made by the frequent occurrence of the growth during pregnancy by the history of gonorrhea, and by the presence of gonococci in the secretions, together with other evidences of gonorrhea; by the age of the individual, and, finally and conclusively, by the microscopic examination of an excised piece in which there is an absence of epithelial invasion of the underlying connective tissue.

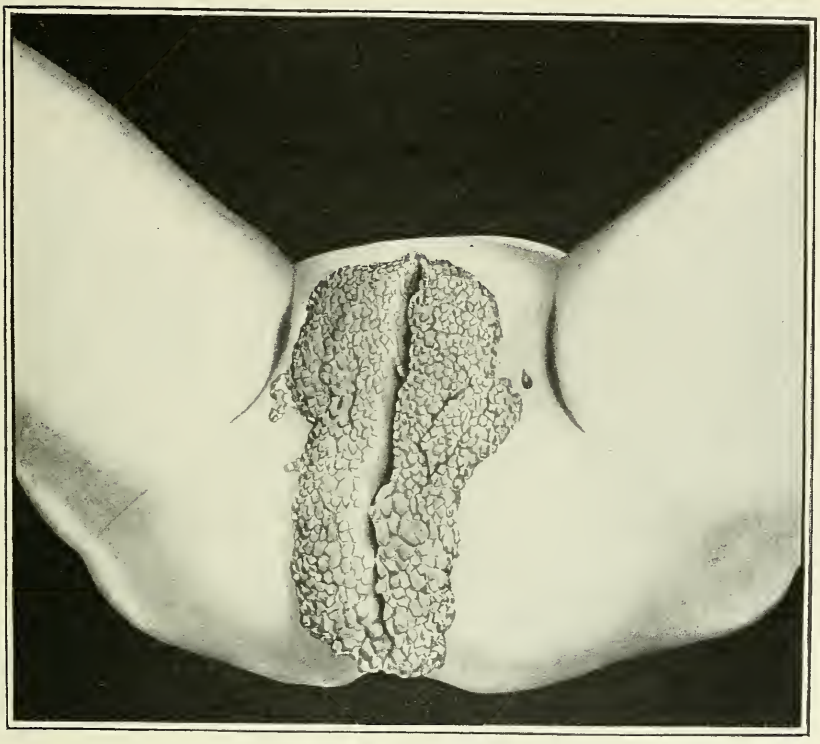
Treatment.—All venereal warts should be excised with scissors and the base cauterized with the thermocautery. This usually requires an anesthetic. When observed in pregnancy these growths should be removed prior to labor as a preventive measure to sepsis in the mother and ophthalmia in the newborn.

In cases of moderate severity, before resorting to operative procedures,

[1] American Gynecology, September, 1902.

the application of equal parts of calomel and salicylic acid may be tried as a dusting powder, or an ointment of zinc oxide and the subnitrate of bismuth may be applied. During this treatment frequent douches of bichloride of mercury (1 to 4000) are given and the patient kept at rest.

Fig. 361



Condyloma acuminata in a child aged nineteen months. (Case of Dr. R. R. Smith.)

Hypertrophy of the Vulva.—*Precocious Development of the Vulva.*—A precocious development of the vulva is occasionally seen in infancy. This condition is usually accompanied by an overdevelopment of the breasts and the early appearance of the catamenia.

Hypertrophy of the Clitoris.—A moderate enlargement of the clitoris is not rare, but in exceptional cases the clitoris may assume the proportions of the penis. In this event amputation of the hypertrophied clitoris is required.

Hypertrophy of the Labia.—The labia are sometimes enormously enlarged. Occasionally they are so large as to be a source of embarrassment to intercourse. Among the Hottentots the labia minora are known to hang between the thighs for a distance of several inches—the so-called "Hottentot apron."

Hypertrophy of the Cervix.—The cervix may be hypertrophied above or below the vaginal attachment.

Supravaginal Hypertrophy.—This condition is usually congenital in origin. As a result the cervix descends and carries with it the vaginal walls to a point where they may present at the vulvar outlet. The process is essentially the same as occurs in descent of the uterus. (See page 319.)

Diagnosis.—The diagnosis is made by inspection, palpation, and the introduction of the sound, as discussed under descensus uteri.

Fig. 362

Feminine pseudohermaphroditism.

Treatment.—The treatment is distinctly surgical and necessitates a high circular amputation of the cervix. When the vaginal walls are relaxed, an anterior and posterior colporrhaphy are required. As a final resort in extreme cases, the suggestion of Baldy should be adopted, that of supravaginal amputation of the uterus and anchoring of the stump to the abdominal wall. (See page 331.)

Infravaginal Hypertrophy.—Here the cervix is hypertrophied below the attachment of the vagina. The condition is congenital and is rare. These cases are not common. The elongation of the cervical tissues may be so great as to cause the cervix to protrude from the vulva. The diameter of the cervix is not, as a rule, increased.

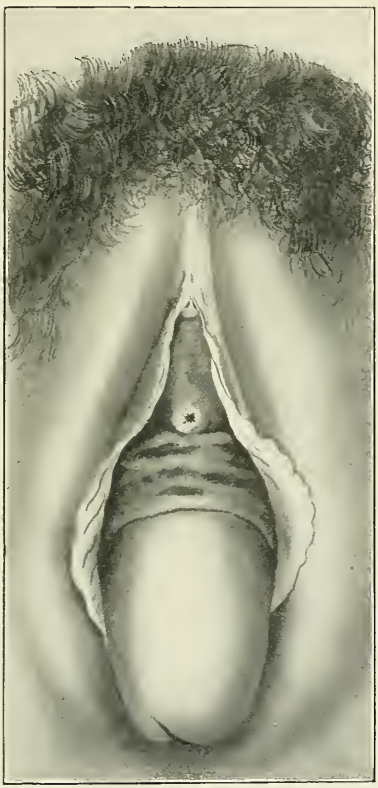
The clinical significance of hypertrophy of the vaginal portion of the cervix depends upon the degree of elongation. When of moderate degree no disturbances arise, but when the cervix is greatly elongated,

sterility, interference with intercourse and with locomotion are complained of. In event of pregnancy labor is retarded by the slow dilatation of the cervix.

Diagnosis.—The diagnosis is made by sight and touch. No difficulty is experienced in recognizing the abnormal length of the cervix. An uncomplicated elongation of the cervix is distinguished from a prolapsed uterus, with or without elongation of the cervix, by noting the position of the fundus in a bimanual examination.

Treatment.—(See Amputation of the Cervix.)

Fig 363



Hypertrophic elongation of the cervix with prolapsus uteri.

Subinvolution of the Uterus.—The physiological involution of the uterus following labor and abortion may be arrested at a point short of the norm, leaving the uterus large and heavy. This hypertrophy may be confined to the body or to the cervix, but, as a rule, both are affected. The endometrium commonly shares in the hypertrophy, as do also the ligamentous supports of the uterus. All of these tissues

are congested, and there is a tendency on the part of the heavy uterus to descend and to fall backward.

History.—The history dates back to a childbirth or abortion. In many instances it is learned that the childbed period was of unusual duration, that there was evidence of a puerperal infection, or that there were unrepaired lacerations. The symptoms above referred to commonly take their origin in these events.

Etiology.—

1. Septic infection.
2. Lacerations of the cervix.
3. Uterine displacements.

A postabortive or puerperal infection will usually check the process of involution in the uterus. A lacerated cervix, *per se*, probably has little influence in causing subinvolution, but the resulting infection, which so commonly follows lacerations, has an important bearing.

Anatomy.—Theilhaber and Meir observed that in childhood the musculature of the uterus is to the fibrous tissue as 2 is to 1, in the multiparous uterus it is as 1 is to 2, while in the postclimacteric period the proportion is again reversed.

It is learned from the observations of Pick and Anspach that the elastic tissues of the uterus play an important role in that they support the blood and lymph vessels, reinforce the musculature, and aid materially in the involution of the uterus. During the first four months of pregnancy the elastic tissue increases in amount, then remains about stationary in the later months of pregnancy, and again undergoes increase during the puerperium. The exception to this rule is found in the cervix when the elastic tissue goes on increasing throughout labor and aids in the dilatation of labor.

In the subinvoluted uterus there is a disproportionate amount of fibrous tissue and a lack of increase in elastic tissue. All this leads to muscular insufficiency with lack of control over the caliber of the bloodvessels which course through the myometrium. This constitutes the anatomical basis for hemorrhage in subinvolution of the uterus.

Symptoms.—

1. *Menstrual Disorders.*— As a rule, the menstrual flow is excessive. The explanation lies in muscular insufficiency of the uterus. The menstrual periods are prolonged and the amount of blood lost may be two or three times the normal amount.

2. *Leucorrhea.*—In the absence of a specific infection or other causes of leucorrhea, there is a hypersecretion from the uterus differing only in amount from the normal secretion.

3. *Sense of Weight in the Pelvis.*—The heavy uterus and relaxed supports lead to a sagging of the uterus and commonly to retroversion. The patient complains of a feeling of heaviness and insecurity in the pelvis.

4. *Dysmenorrhea.*—The menstrual periods are usually accompanied by heavy cramping pains in the hypogastrium and by backache.

Sterility.—While subinvolution of the uterus does not preclude the possibility of childbearing, it is true that the conditions are not favorable. This is one explanation for the so-called "habit of abortion."

The associated lesions, *i. e.*, displacements, lacerated perineum, and cystic degeneration of the ovaries, give rise to symptoms which are not to be credited to subinvolution of the uterus.

Diagnosis.—The diagnosis is determined by a consideration of the history, by the complaints of the patient, and by a physical examination.

Physical Examination.—Bimanual examination reveals a uniformly enlarged uterus, somewhat soft in consistency, uniform in outline, freely movable, and not sensitive to pressure. Downward and backward displacements are common. Placing a sound in the uterus will demonstrate an increase in size of from one-half inch to an inch.

Prognosis.—If taken in the early stages of its development, much can be done to favor involution, but in the chronic stage, when hyperplastic changes have developed, there is little hope of relieving the condition.

Treatment.—It is important to arrest the condition in the early stages of its development.

Early Stage.—To prevent permanent enlargement of the uterus the following precautions should be taken:

1. Prevent infection of the uterus by strict observance of all rules known to the obstetric art.
2. Avoid keeping the parturient woman on her back an undue length of time.
3. Repair all lacerations early.
4. Examine every woman at the end of the puerperium. When the uterus has failed to involute no time should be lost in the effort to encourage full involution. The following measures should be adopted:

1. Repair of neglected lacerations. This should be done not later than ten to fourteen days after labor.
2. Correct all recent displacements by a properly fitting pessary.
3. Hot vaginal douches two or three times a day.
4. The administration of small doses of ergot or ergotin over a period of several weeks.
5. Ichthyol and glycerin tampons introduced before going to bed and removed in the morning. These tampons to be preceded and followed by hot vaginal douches.
6. Discontinue all treatments during the menstrual period.
7. If there is evidence of infection the uterus should under no circumstances be curetted.
8. It is essential to look to the general condition of the individual. The diet should be nutritious and the bowels regulated with saline cathartics. The patient should be restricted in her exercises.
9. The Nauheim baths are of great value in the management of these cases, inasmuch as they tend to equalize the circulation and relieve passive congestion in the pelvis. (See page 195.)

Late Stage.—All that has been recommended for the management of subinvolution in the early stages applies to the late stage, but with less promise of good results. When the condition has become chronic, surgery must be invoked.

The following surgical procedures are applicable:

1. *Curettage.*—It is observed that curettage hastens involution. This should not be done if the uterus is infected.

2. *Amputation of the Cervix.*—When the cervix is elongated, and particularly when lacerated and eroded, the wedge-shaped amputation of Schroeder should be done.

3. Correction of uterine displacements and lacerations of the cervix and pelvic floor.

4. Subtotal hysterectomy is indicated when the uterus is greatly enlarged and gives rise to pressure symptoms and hemorrhage. (See page 441.)

Hypertrophy of the Ovary.—The size of the ovary varies within wide limits, and hence it is not always possible to distinguish between a normal ovary and one that is hypertrophied. Hypertrophy of the ovary frequently complicates uterine fibroids. An hypertrophied ovary measuring four inches in length was removed by Webster, together with a fibrocystic tumor of the uterus which weighed eighty-seven pounds.

In true hypertrophy there is an increase in the amount of ovarian tissue. This condition is not to be confounded with hyperplasia of the connective-tissue stroma, the result of passive congestion and inflammation. There are no characteristic clinical signs of hypertrophy of the ovary. Early puberty, unusual sexual vigor, and a late menopause are the usual clinical manifestations.

CHAPTER XXVI

NEW-FORMATIONS OF THE VULVA AND VAGINA

New-formations of the Vulva
- Benign Tumors of the Vulva
  - Fibroma
  - Lipoma
  - Enchondroma
  - Neuroma
  - Sebaceous Cysts
  - Dermoid Cysts
  - Vulvar Cysts
  - Cysts of the Hymen

Malignant Tumors of the Vulva
- Cancer of the Vulva
- Sarcoma of the Vulva

New-formations of the Vagina
- Cysts
- Fibromyoma
- Carcinoma
- Sarcoma
- Syncytioma Malignum
- Endotheliom

NEW-FORMATIONS OF THE VULVA

Benign Tumors of the Vulva.—Benign tumors of the vulva are of rare occurrence.

Fibromata arise from the subcutaneous connective tissue of the labia majora and minora, but rarely from the clitoris. They are slow in their growth, and firm, round, and sharply circumscribed. The overlying skin is not adherent to the tumor. They are known to grow to the size of the patient's head and to hang by a pedicle to the level of the knees. The microscope shows the tumor to be composed of connective tissue intermixed with a limited amount of smooth muscle fiber. Cystic degeneration and calcareous deposits have been described.

Lipomata rise from the subcutaneous fat of the mons Veneris and labia minora. They are not so frequently found as are fibromata. They are usually circumscribed, soft in consistency, sometimes apparently fluctuating, and are attached either by a broad base or by a pedicle. The author has found only 22 cases of lipoma of the vulva in the literature. They have been seen from the fifth month of infancy to the fifty-first year.

Enchondroma has not yet been fully established.

Neuroma has been described as a sensitive papilla or wart, though the description leaves some doubt as to its identity. Peckham described a cyst of the clitoris weighing 60 grams and filled with a chocolate-colored fluid.

Sebaceous cysts are found in the labia, at the base of the prepuce, and at the base of the hymen. They appear in the form of small, yellowish, semitransparent elevations filled with sebaceous material. Small, soft-walled cysts, lying at the free margin of the hymen, may be regarded as lymph cysts.

Dermoid Cyst of the vulva is of rare occurrence.

Vulvar Cysts have little clinical significance. An accompanying pruritus may disclose their presence.

Cysts of the Hymen.—Little is known of cysts of the hymen. Wenkel made the first report of these cysts in 1883. Palm described one measuring 8 cm. in diameter. The average diameter is about 1 cm. Many

FIG. 364

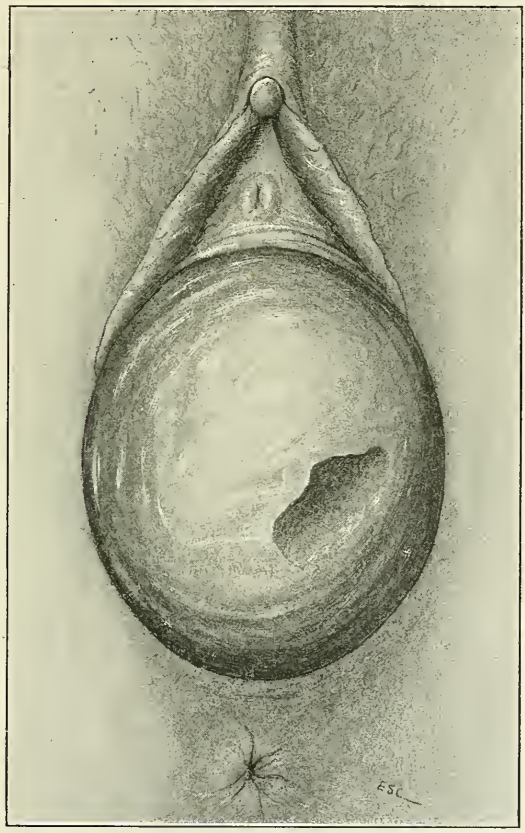
Pedunculated fibroma of the vulva.

do not exceed 1 mm. in diameter. They are usually congenital, though they may not be observed until late years. One or more cysts are located near the free margin of the hymen. These various sources explain the presence of a variety of epithelium lining the cyst cavity. As a rule, the epithelium is squamous and stratified, but is occasionally cylindrical, and in a few instances endothelium is found.

The origin of the cysts of the hymen is in many cases the epithelial projections. These projections become constricted off and form the epithelial wall of a space which fills with serum. A few cases apparently arise from Gärtner's duct, from dilated lymph spaces, and from retention of the secretions of sebaceous glands.

In a valued original communication on the "Anatomy, Pathology, and Development of the Hymen"[1] G. Gelhorn presents numerous lesions of the hymen not generally recognized.

Fig. 365



Fibromyoma of the posterior wall of the vagina. Surface ulcerated.

Tumors of the hymen are rare. Gelhorn finds 17 cases of hymeneal cysts in the literature, 2 cases of polypi, and 1 of angioma. Sänger reported a case of primary sarcoma of the hymen. As yet no case of primary carcinoma of the hymen has been reported.

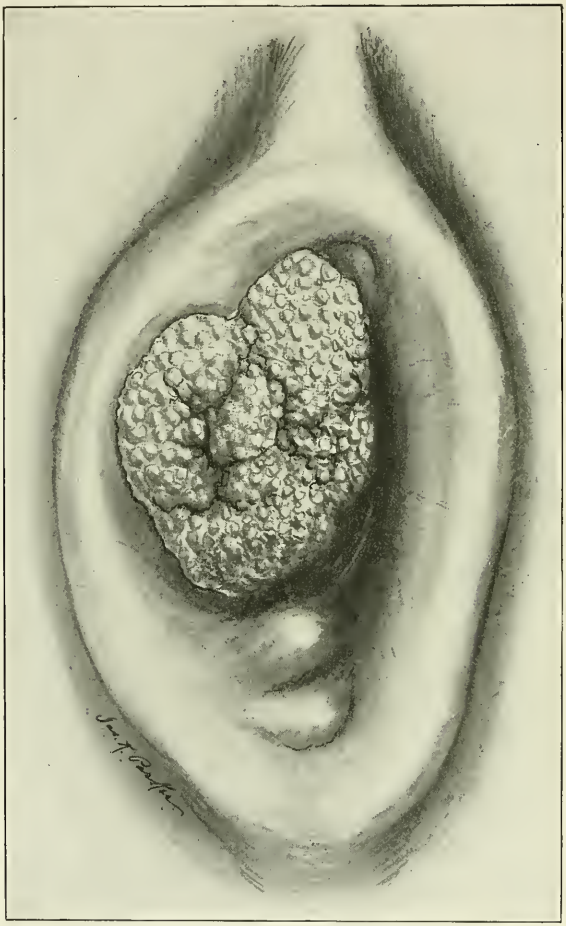
Treatment.—All benign tumors of the vulva should be excised and the wound closed with silkworm-gut. The sutured wound is covered

[1] Amer. Jour. Obstet., August, 1904.

with a dressing of sterile gauze, held in place by a T-binder. The sutures should be removed on the seventh day.

Cancer of the Vulva.—The vulva is strangely exempt from infection and malignant degeneration. In 1147 cancers of the female genitalia Schwarz found 30 to be primary in the vulva. Wenkel tabulated the

Fig. 366



Carcinoma of the vulva. A cauliflower growth two inches in diameter was located in the right labium majorum. The tumor was friable and bled freely to the touch.

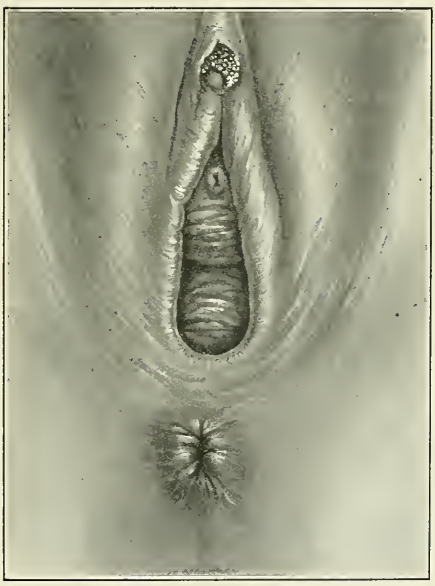
report of 54 cases, in which he found 6 before the age of forty, 16 between forty and fifty, 20 between fifty and sixty, and 20 over sixty years of age.

The site of predilection is the outer skin surface of the labia majora; less frequent points of invasion are the frenum, clitoris, Bartholinean

glands, anterior and posterior commissure, and urethral opening. The labia minora are seldom a primary site.

The lesion is characterized by superficial infiltration, by ulceration, and by early involvement of the inguinal glands. The growth may be diffuse or circumscribed. The circumscribed growths rarely fail to rise above the level of the surface of the skin. They are commonly round or oval, and the surface smooth, nodular, or papillary. They may grow to the size of a man's fist. At first firm in consistency, sooner or later they disintegrate and form more or less superficial ulcers. The diffuse form may not be evident to the naked eye, and is recognized by its rigid, firm feel. Superficial ulceration is usually not long in

FIG. 367



Early carcinoma of the vulva, confined to the clitoris. (Martin.)

appearing. There is nothing uncommon in the appearance of the ulcer; the base is uneven, bleeding freely to the touch, and is covered with a purulent, foul-smelling secretion; the margins of the ulcer are irregular, hard, and elevated. In advanced cases the ulceration may extend to deep crater-like excavations, with markedly infiltrated borders (Fig. 366).

Schwarz found the inguinal glands infiltrated with cancer cells eleven times in twenty-three cases. The rate of growth is often slow. The direction to which the growth extends varies. Usually the extension is to the vagina and from the vagina to the rectum, bladder, and pelvic connective tissue. In not a small percentage of cases the opposite labium is invaded (contact metastasis).

The microscopic characters of vulvar carcinoma differ somewhat from those of cancer of the vagina and cervix. There is an unusual tendency on the part of the epithelial projections to branch. Cancer pearls are said to be relatively rare, although in two specimens, one removed by Dr. Reuben Peterson and the other by Dr. J. Clarence Webster, the author found an unusual number of cancer pearls. The extension of the cancer cells along the lymphatics gives the appearance of veins of marble.

Fig. 368

Lymphadenoma of the vulva. (Hertzler.)

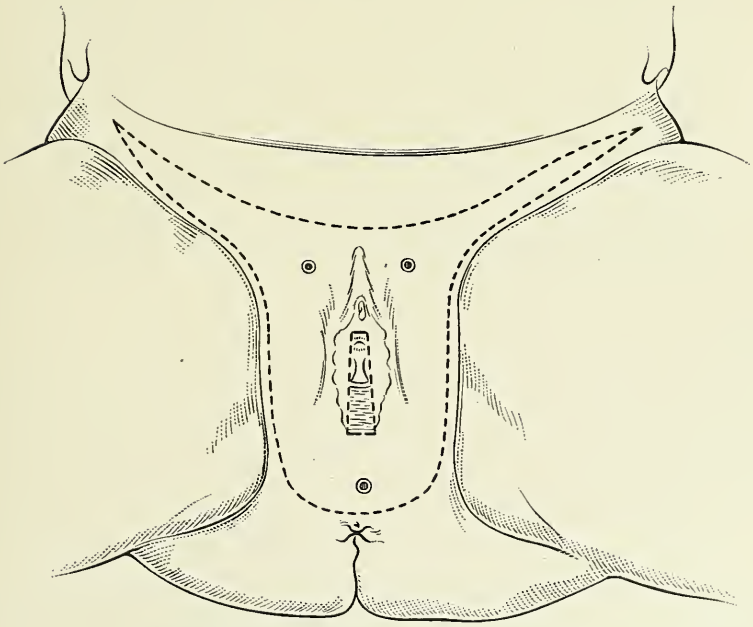
Cancer of the glands of Bartholin is rare. The gland may assume the size of a man's fist, become hard and nodular, with a movable, normal appearing overlying skin. The diagnosis without the aid of the microscope is hardly possible. The lesions to be considered in making a diagnosis are the benign new-formations (lipoma, fibroma), with ulcerated surface, ulcus rodens, tuberculosis, syphilis, and elephantiasis. In making the diagnosis, one must rely upon the age of the individual, the general effect upon the system, early and superficial ulceration, involvement of the inguinal glands, and above all, upon the microscopic examination of an excised piece of the tumor. The prognosis is relatively good. Schwarz saw ten recoveries in twenty-three cases.

Treatment.—Cancer of the vulva requires early and radical removal. Not only should the growth be widely excised, but the inguinal glands should also be removed. The loose texture of the structures of the

Fig. 369

Early adenocarcinoma of the vulva, limited to the left lesser labium. (Hurdon.)

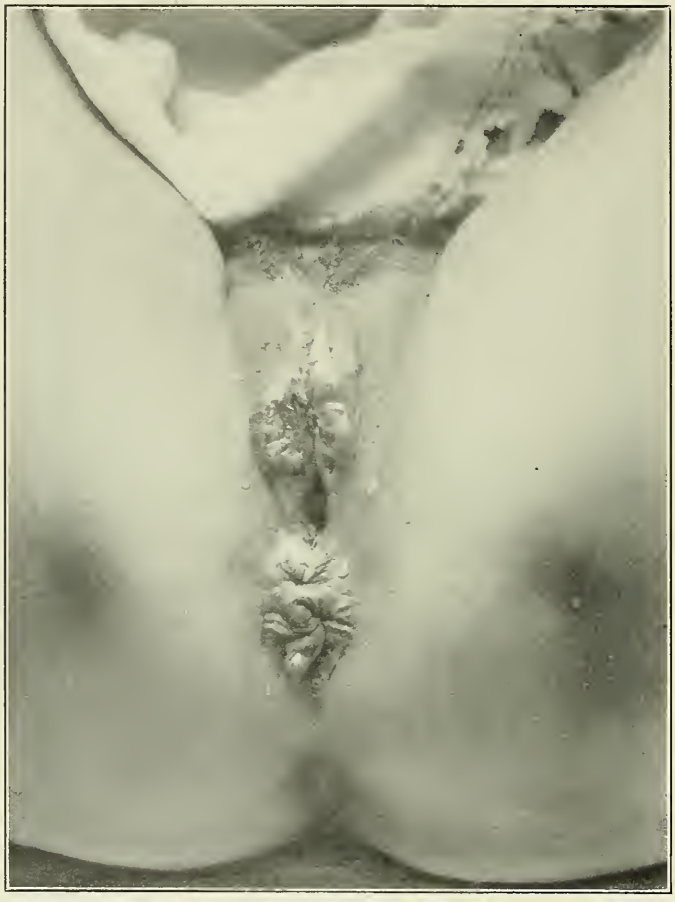
Fig. 370



Extirpation of the vulva. Lines of initial incisions.

vulva permits of ready approximation even after a large area is removed. Fig. 370 presents an outline of the area to be resected in advanced cases.

Fig. 371



Carcinoma of the vulva. (Hertzler.)

Palliative Treatment.—Following the removal of the growth and in all inoperable cases, the *x*-rays should be applied at intervals. When the growth is too far advanced to permit of removal, the cancerous tissue should be deeply cauterized and a moist dressing of the following solution applied:

℞—Glycerin	ʒiij
Water	ʒviij
Formalin	♏xv

A vulvar pad is saturated with this solution and held in place by a T-binder. Frequent vulvar douches of formalin (1 to 4000) should be given.

Prognosis.—Taussig compares the prognosis of cancer of the uterus with cancer of the vulva, and reveals the interesting fact that while it is generally true that superficial cancers give a more favorable prognosis than do the deep-seated cancers, the reverse is true of genital cancers in women. He gives the percentage of cures in cancer of the body of the uterus as 80, in cancer of the cervix between 20 and 30, and in cancer of the vulva as 12. He accounts for the high mortality in cancer of the vulva by the advanced age of the patient, (average sixty to sixty-five years), early metastasis to tributary lymph glands, and the proximity of the cancer to the urethra and pubic arch. In cancer of the vulva, as in cancer elsewhere in the body, the secret of successful results lies in early diagnosis and in early operation.

Sarcoma of the Vulva.—This is a very rare lesion. Hunter Robb has described a myxosarcoma of the clitoris. Melanotic sarcoma of the vulva is an intensely malignant growth. Bailley reported a melanosarcoma in a woman, aged seventy-two years.

Recurrence is almost certain. Mueller removed from the labium minor a melanosarcoma as large as a walnut. There was no recurrence until the end of three years. Fisher reports a recovery in a woman, aged fifty-six years, from whom a melanosarcoma the size of a walnut was removed from the labium major.

Treatment.—(See Cancer of the Vulva.)

NEW-FORMATIONS OF THE VAGINA

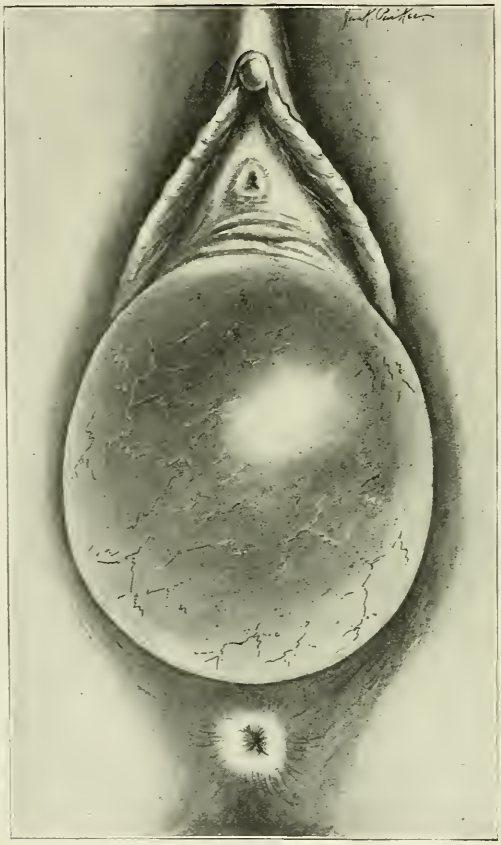
Cysts of the Vagina.—Cysts of the vagina are not of great rarity. Neugebauer found 36 cases in 600 observations (Fig. 372).

Histogenesis.—The fact that the epithelial lining of the cysts varies in form suggests various origins. Veit believes them to develop from remains of the Wolffian ducts. The ducts of Gärtner do not ordinarily continue below the vault of the vagina, but instances are known in which they extended as far as the urethral opening along the lateral and anterior walls of the vagina. In these ducts muscle fibers and cylindrical epithelium are observed, and it is believed by some that cysts located in the sides or in the anterior wall of the vagina, and containing muscle fibers and epithelium, arise from the ducts of Gärtner. As further evidence of this origin, may be mentioned their occasional elongated form with their long axis in a line corresponding to the long axis of the vagina. Still more significant is the rosary-like arrangement of two or more cysts along the line of Gärtner's duct.

Preuschen suggests that the origin of vaginal cysts may be the glands of the vagina. Cysts lying in the posterior wall of the vagina are thus explained. They are regarded as retention cysts. Davidson holds that the glands of the vagina are purely misdevelopments. Those in the upper segment of the vagina are misplaced from the cervix and maintain the character of cervical glands, while those in the lower segment of the vagina are from the vulva. Retention cysts arising

from these glands are usually multiple, of small size, and lined with a single layer of columnar epithelium. Cysts may arise from partial adhesion of the folds of vaginal mucous membrane inclosing spaces lined with flat epithelium.

Fig. 372



Cyst of the anterior wall of the vagina. A thin-walled, translucent cyst protrudes from the vulva. Such a growth may be mistaken for an inverted uterus or a complete prolapsus uteri. The cyst fluctuates, there are no tubal or cervical openings, and the uterus is found in its normal position by a recto-abdominal examination.

Freund believes that cysts of the vagina arise from the rudimentary ducts of Müller. Furthermore, it is apparent that the lymph spaces may distend into cysts lined with endothelium.

Cysts of the vagina are rarely of large size, ranging from that of a pinhead to a hazel-nut. In exceptional cases they are as large as a child's head. They are slow in growth. The sites of election are the anterior and lateral walls, rarely the posterior wall of the vagina. They lie immediately underneath the epithelium and bulge into the vagina.

The consistency is elastic and the contents clear, watery, or mucoid. Occasionally the contents are milky from the presence of degenerated epithelium; sometimes chocolate colored from admixture with blood. Cheron reports the presence of a stone in a cyst. Cholesterin crystals are occasionally found. As a rule, the cysts are simple, but they may be multilocular. The cyst wall is composed of fibrous tissue, occasionally mingled with some muscle fibers. The inner surface is generally lined with a single layer of cylindrical epithelium, but sometimes with several layers of cylindrical or flat epithelium. It is seldom that endothelial cells are found. They are not usually of clinical interest, but are known to interfere with sexual intercourse and with childbirth, and have been mistaken for prolapsus uteri and inversion of the uterus.

Treatment.—The treatment of cysts of the vagina is surgical, and consists of partial or complete removal of the sac.

Partial Removal of the Sac.—Unless the cyst is superficial and small, no attempt should be made to remove the entire sac for fear of injury to the bladder, rectum, ureter, or peritoneum. When the dissection is deep there is great danger from troublesome bleeding.

Technic of Operation.—The patient is placed in the lithotomy position and the cyst exposed by specula.

Step 1.—The cyst is grasped at its apex by bullet forceps, and a second pair is made to grasp the cyst wall a half inch removed from the other forceps. The sac is then opened with a knife and its contents emptied. Through the opening the examining finger explores the cavity of the cyst and notes its relations to surrounding structures.

Step 2.—The incision in the sac wall is extended to the limits of the sac, and each half of the sac wall is excised to the level of the vaginal wall.

Step 3.—The margins of the cyst wall are stitched to the cut edges of the vaginal wall with chromic catgut. The cavity of the cyst is then packed with iodoform gauze and a sterile dressing applied and held in place by a T-binder. The gauze is removed at the end of forty-eight hours and the open wound kept clean by frequent antiseptic irrigations until healing is complete.

Complete Removal of the Sac.—Only small and superficial cysts should be wholly removed. The cyst is removed by incising the vaginal wall over the sac and dissecting the sac *en masse* from the surrounding structures; then closing the wound with catgut.

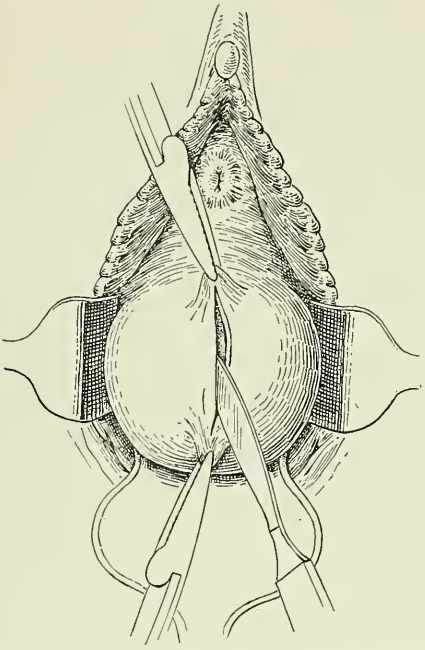
Fibromyoma of the Vagina.—Richard R. Smith collected 101 cases from the literature. They commonly occur between the ages of twenty and forty years, and have been observed as early as one and a half years and as late as seventy-eight years. The largest one recorded weighed ten pounds. They are usually round and attached by a broad base or pedicle. The surface is smooth or nodular, and is covered with vaginal mucous membrane. They are seldom of soft consistency. Their origin is in the submucous connective tissue. They are rarely multiple, and are generally located in the anterior wall of the vagina. The usual forms of degeneration common to fibroids are possible. The

diagnosis is not difficult. A soft fibroid might be mistaken for a cyst, a cystocele, or a rectocele. The bluish, semitransparent color of the cyst is of special significance.

Treatment.—The treatment consists in the removal of the tumor. Caution must be exercised for fear of injuring the bladder, rectum, ureter, or peritoneum.

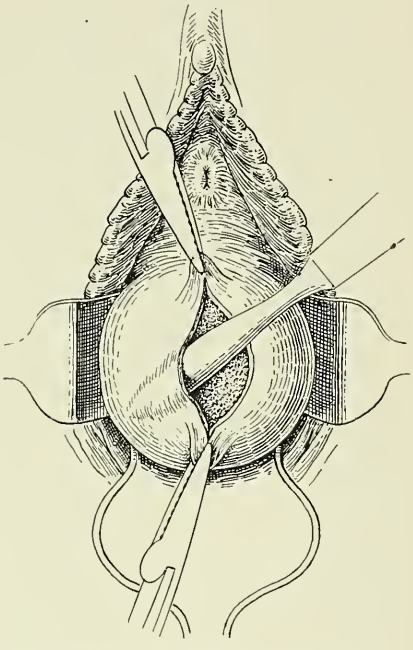
The vaginal wall is incised over the tumor; the tumor enucleated with a blunt dissector, all bleeding-points secured by ligatures, the redundant vaginal walls excised, and the wound closed with chromic catgut.

FIG. 373



Enucleation of a vaginal cyst. Vertical incision made through the vaginal wall. (Modified from Ashton.)

FIG. 374



Step 2. Vaginal wall reflected from the cyst by a dissector. (Modified from Ashton.)

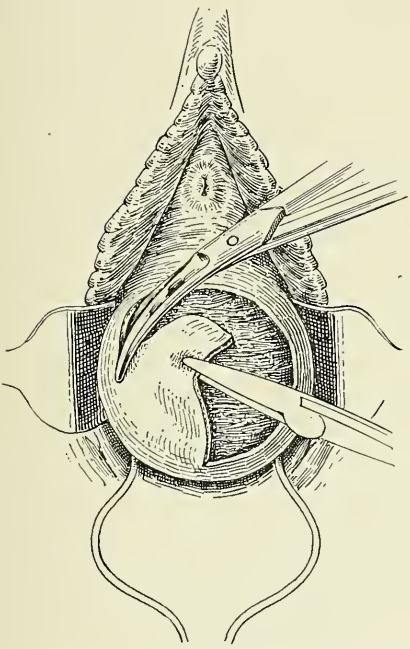
Carcinoma of the Vagina.—Etiology.—Less than 1 per cent. of all cancers in women are of vaginal origin (Williams, Bristol). Küstner collected 22 cases of primary cancer of the vagina, and estimates that about 0.02 per cent. of cancers of the genital tract arise primarily in the vagina.

As a rule, primary carcinoma of the vagina arises between the ages of fifty and sixty; two cases are reported at twenty years of age. Childbearing does not influence the development of the growth, and heredity plays a minor role. A number of cases have been recorded in which ill-fitting pessaries have caused ulceration and eventually malignant

degeneration. Prolapse of the vaginal walls subjects the vagina to mechanical insults, and upon the injured surface a carcinoma may be developed (Fig 377).

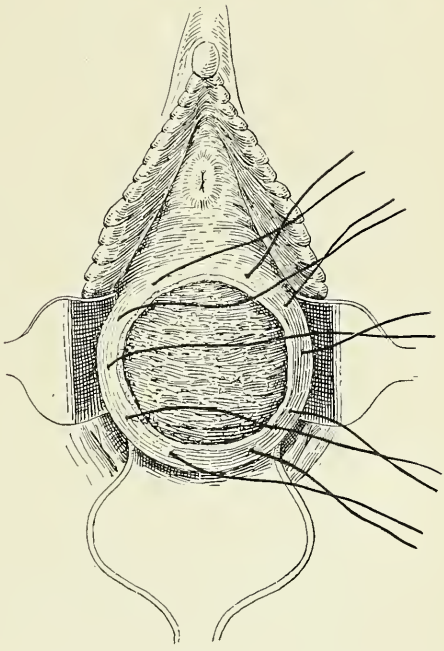
Anatomical Diagnosis.—In 123 cases 71 were found on the posterior vaginal wall, 13 on the lateral walls, and 16 were annular. The growth may be papillary, nodular, or infiltrating. To the unassisted eye cancer of the vagina usually presents a thickened, ulcerated area. The margins are irregular, hard, and elevated. The base of the ulcer is uneven, bleeds freely on handling, and is covered with a foul-smelling secretion.

Fig. 375



Step 3. Part of cyst wall excised. The cyst extends too deeply into the underlying structures to permit of complete enucleation.

Fig. 376

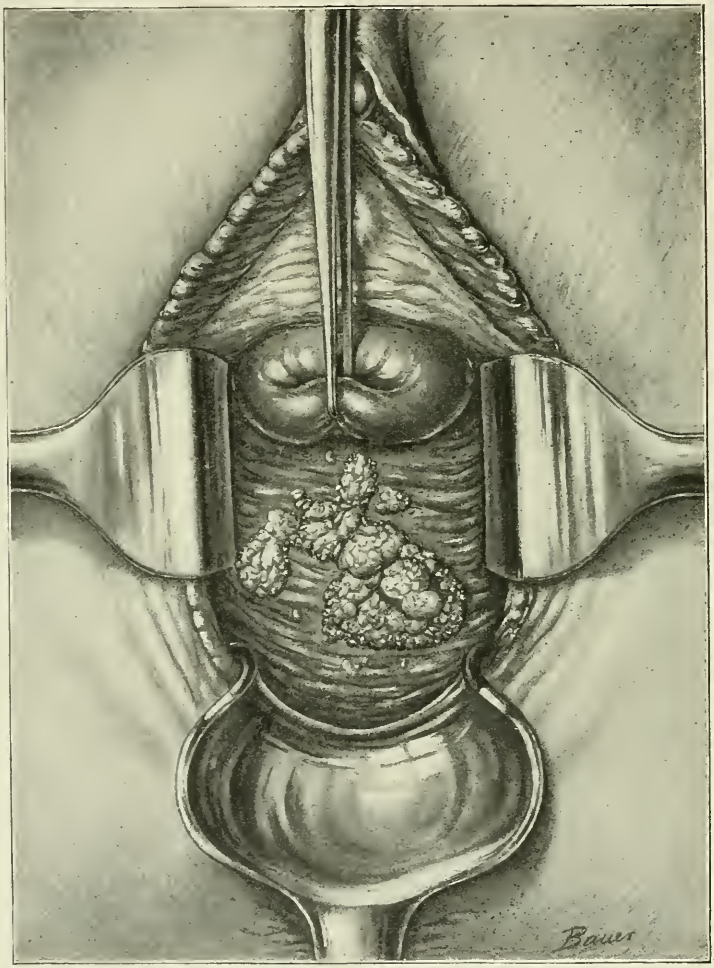


Step 4. Sutures placed for closure of the cavity. When the cyst is not wholly removed the cavity should be packed with iodoform gauze and left open to heal by granulation tissue.

Surrounding the vagina the tissues show an inflammatory reaction, and secondary nodules may be seen distributed over the surface. The growth rarely attains the size of a man's fist. Extension into the paravaginal tissue is rapid. Reaching the lymph spaces of the paravaginal connective tissue, the cancer cells are rapidly carried to the retroperitoneal glands. The inguinal glands are enlarged when the lower segment of the vagina is invaded. As a rule, the uterus is not invaded so early as the vulva, and metastasis to distant organs is late. The microscope shows nothing unusual. The tumor is a flat-cell growth, the cells are arranged in nests, and contain many pearls.

Clinical Diagnosis.—The lesion may go unrecognized until far advanced. As with cancer of the uterus, all symptoms may be wanting until there is ulceration and sloughing of the growth. Hemorrhage, pain, and a foul-smelling discharge are the cardinal symptoms, but

Fig. 377



Primary carcinoma of the vagina. On the posterior wall of the vagina is an irregular infiltrated area, friable and bleeding.

they do not differ in any manner from the same group found in cancer of the vulva or uterus. Pain is rarely present until the growth has extended into the paravaginal tissue, and the absence of pain is a marked feature in the early stage.

Stenosis of the vagina may hide a growth lying above the point of constriction, and render the early diagnosis perplexing.

Secondary cancer of the vagina is of frequent occurrence. Cancer of the cervix is especially liable to extend to the vagina, but normal tissue may intervene between the primary growth in the cervix and the secondary growths in the vagina. Cancer of the bladder and rectum rarely invade the vagina. Metastatic growths from the ovary are seldom observed in the vagina.

Wahn, Fisher, and Kalkenbach report implantations of cancer cells upon eroded surfaces in the vagina through the medium of a leucorrheal discharge. The secondary growths take the same histological forms as the primary growth. The average duration of primary cancer of the vagina is said to be sixteen months, but it may last several years.

Differential Diagnosis.— *Decubitus ulcers* caused by ill-fitting pessaries may be mistaken for carcinoma, and have been known to be its starting-point. The hard, elevated margins, friable and bleeding when handled, are distinctive of malignancy. When doubt exists, a microscopic examination of an excised piece, or scrapings from the suspected portion, will determine the diagnosis.

Syphilitic and tuberculous ulcers of the vagina are recognized by the clinical history, by evidences of lesions elsewhere in the body, and by microscopic examination of excised pieces. Friability and bleeding of the suspected tissue are suggestive of carcinoma.

Treatment.—Early and complete removal of the growth is the only effective treatment.

Radical Treatment.—When the growth is limited in extent only a part of the vaginal wall need be sacrificed, but when the growth is extensive it may require the extirpation of the entire vagina.

Removal of the growth.

Step 1.—The tumor is exposed by specula. An incision is made far outside the infiltrated area and around the entire circumference of the growth. The tumor is then pulled forward by bullet forceps and dissected from the underlying tissues. So far as possible a blunt dissector should be used.

Step 2.—The wound is then united by sutures of chromic catgut. When the bladder or rectum are invaded the incision must be carried through these structures. The inguinal glands should be removed in all cases. After placing the sutures the vagina is packed with iodoform gauze and a T-binder adjusted. The gauze is removed at the end of forty-eight hours and daily antiseptic vaginal douches are then given. When the base of the bladder has been excised a self-retaining catheter should be worn for ten days.

Total Extirpation of the Vagina.—There is little encouragement in performing such an extensive operation as the removal of the entire vagina, because when this is required, the disease has advanced beyond hope of radical removal.

Palliative Treatment.—When the disease is inoperable, palliative measures should be resorted to. These consist in thoroughly curetting

the cancerous friable tissue, cauterizing the surface, and applying acetone. The treatment is that advised for inoperable cancer of the cervix. (See Cancer of the Uterus.)

The *x*-rays are of value in inoperable cases, and should also be applied in all cases following operation.

Sarcoma of the Vagina.—Sarcoma of the vagina is found in all ages, from the first to the eighty-second year. Six so-called congenital cases are reported. Of 40 cases reported by Williams, 36 occurred before fifteen years of age.

The growth is usually polypoid, of a yellowish-gray or chocolate color. Rarely is there a diffuse infiltration of the vaginal walls, the surrounding structures being early invaded. Distinct metastasis is late, and does not often occur. There is a tendency to early necrosis of the tumor mass, together with infection of the necrotic mass by pyogenic microörganisms, leading to cystitis, pyonephritis, and peritonitis. Late in life sarcoma is usually smooth rather than rough and polypoid as in early life.

Histologically, the growth is demonstrated to be a fibrosarcoma, myxosarcoma, round-cell or spindle-cell sarcoma, or, finally, a melanosarcoma.

The diagnosis of sarcoma, apart from carcinoma, cannot be made without the aid of the microscope.

Treatment.—(See Cancer of the Vagina, page 573.)

Syncytioma Vaginæ.—Syncytioma malignum (or, as better named, chorio-epithelioma malignum) occurs with relative frequency as a secondary growth in the vagina.

Schmidt lately reported two cases of primary growths in the vagina. In both cases the uterus remained normal.

Küble removed a primary syncytial growth from the vagina, and in twenty days it had recurred.

All newgrowths of the vagina developing weeks and months after labor should be incised and examined, with special regard for malignant proliferation of the syncytium. To the unaided eye the tumor is usually round and elevated. It is of a bluish color. Ulceration is rare. On cross-section the tumor is exceedingly bloody, and may resemble a blood-clot. (See page 174.)

Endothelioma of the Vagina.—Endothelioma of the vagina is an exceptional growth. The first case was reported by Klein. By the naked eye the growth cannot be distinguished from a carcinoma. Microscopically the tumor is found to be composed of cells resembling flat epithelium, arranged in a thick mesh-work of connective tissue. The cells arise from the endothelium of the blood or lymph spaces. In distribution they resemble veins of marble.

Treatment.—(See Cancer of the Vagina, page 573.)

CHAPTER XXVII

FIBROMYOMA OF THE UTERUS

Etiology
Histogenesis
Anatomical Diagnosis
Recurrence
Microscopic Diagnosis
Adenofibromyoma Uteri
Degeneration of Fibroids
Clinical Characteristics
Clinical Diagnosis
Differential Diagnosis
Effect on Neighboring Organs
Treatment
Operations for Uterine Fibroids
Vaginal Myomectomy
Vaginal Hysterotomy
Vaginal Celiotomy
Abdominal Myomectomy
Hysteromyomectomy
Vaginal
Abdominal
Fibroids Complicating Pregnancy, Labor, and Puerperium

Etiology.—But little is known of the essential cause of uterine fibroids. Certain factors are known to influence their origin and development, and will be briefly discussed.

1. **Heredity.**—Heredity has been much referred to as a predisposing cause of uterine fibroids. While there are families in which two or more members are known to have fibroid tumors of the uterus, the influence of heredity is not to be overestimated. Engstrom, in five hundred and thirty cases of uterine fibroids, found a similar lesion in the mother or sisters thirteen times. It has been stated that myomatous patients come of large families. In the experience of Roger Williams they averaged 8.1 members each.

2. **Age.**—The usual time of occurrence is during the period of sexual maturity. Fibroids of the uterus are rarely found before puberty, though it is highly probable that most, if not all, of these growths are of congenital origin. They occur with greatest frequency between the ages of thirty and forty, and are rarely known to arise after the menopause. Miller reported 299 cases of uterine fibroids, of which number 120 were observed after forty-five years of age. Of the 1762 cases collected by Roger Williams, 26 were under twenty years of age. Gusserow reported 1 case ten years of age. Pick described a fibroid of congenital origin. Cavaillou reports one weighing 3 kilograms in an infant three years of age. At the other extreme of life is a submucous myoma at ninety-two years of age (Van Rensselaer) and a calcified myoma at eighty-six (Wright). It is evident from the study of statistics that fibromyomata are prone to arise at a time when the sexual functions are waning.

3. **Civil State.**—It has been stated that fibroids of the uterus are especially liable to occur in women who have not borne children and are not married. The number of children born to myomatous women

is below the average, while abortions are relatively common among them. The average number of children born of myomatous women is estimated at 2.5, as compared with the usual number of 4.5. Thirty per cent. of myomatous women are sterile as opposed to 10 per cent. of sterility in general. On the other hand, sexual excesses are said to favor the growth of uterine myomata.

4. **Race.**—The negress is generally regarded as preëminently susceptible to uterine fibroids. This is denied by Kelly and Williams, of Johns Hopkins University, where there is abundant opportunity to make reliable observations. In 357 cases reported by Williams, fibroids were only 2 per cent. more frequent in the colored race. They are said to be unknown among savages.

5. **Frequency.**—Boyle holds that 20 per cent. of women who reach thirty-five years of age have fibroids of the uterus, while Klobs affirms that 40 per cent. of women who reach fifty years of age have fibroids of varying size and number. The lesion is often overlooked even in postmortem examinations. Of all non-malignant tumors uterine myomata are by far the most common. Roger Williams estimates that 10 per cent. of all tumors in women are uterine fibroids.

Influence of Menstruation, Pregnancy, and the Climacterium upon Fibromyomata.—1. **Menstruation.**—Menstruation is accompanied by a slight enlargement and softening of uterine fibroids, due to increased vascularization. Near the end of the menstrual flow the tumor reassumes its normal proportions.

2. **Pregnancy.**—Pregnancy is accompanied by a rapid increase in the size of the tumor. There is a corresponding softening of the growth. Such rapidly growing fibroids are prone to become incarcerated and to seriously interfere with pregnancy. Simultaneous with the involution of the uterus in the puerperium there is sometimes a rapid decrease in the size of the tumor. They are even said to wholly disappear, though this is doubtful. However, they are sometimes reduced in size by the end of the puerperium. The rule is that they are not markedly reduced in size but on the contrary continue to grow after the climacterium and tend to degenerative changes and extrusion.

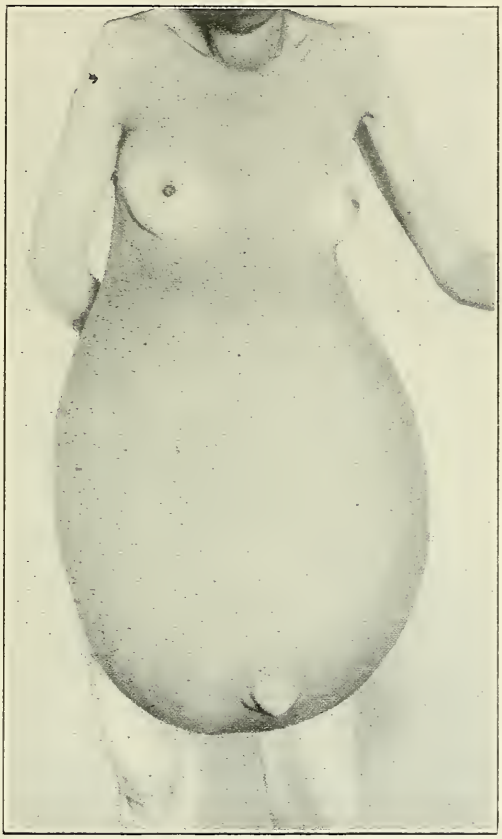
3. **The Climacterium.**—The climacterium is generally credited with having a favorable influence upon the growth of uterine fibroids, but experience points to the reverse. The rule is that they continue to grow and are more liable to degenerative changes at this time of life than at any other. Progressively growing postclimacteric fibromyomata are plentiful in the literature. Herman reported one growing thirteen years after the menopause. Tait removed one twenty years after the climacterium. Van Rensselaer removed a submucous myoma from a woman ninety-two years of age.

Histogenesis.—According to Kleinwachter, fibroids originate from round cells found in bloodvessels, which later become obliterated. The round cells are converted into muscle and connective-tissue fibers.

Rösger believes their origin to be in the muscle fiber of bloodvessels. Gottschalk is of the opinion that it is not the musculature of the blood-

vessels that forms the matrix of the tumor. He observed amebic movements in certain protoplasmic bodies which he interpreted to be parasites, and believed them to be the essential cause of fibroids. Vedeler thought he discovered animal parasites in uterine fibroids. Virchow believed them to be a hyperplasia of the uterine musculature. Judging from the above conflicting opinions, it is evident that nothing is positively known of the histogenesis of uterine fibroids.

FIG. 378



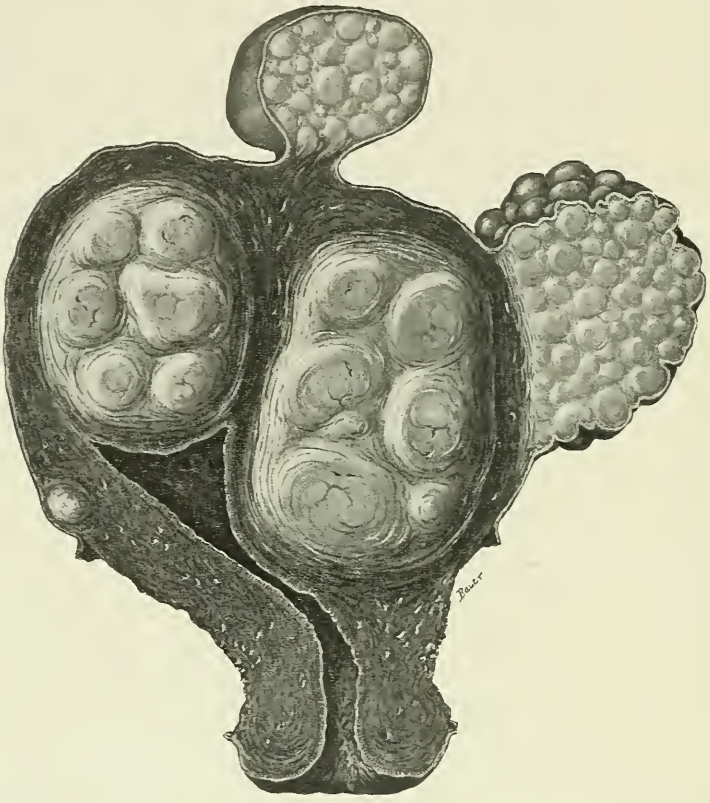
Cystic fibromyoma of the uterus weighing thirty-seven pounds. Successful removal. (Dr. J. Clarence Webster.)

Anatomical Diagnosis.—Under this head we will consider the size, form, consistency, rate of growth, number, and position of the tumor, and also its microscopic structure.

In *size* uterine fibroids vary from almost microscopic dimensions to the tumor reported by Hunter, weighing 140 pounds and that of Severann weighing 195 pounds. Webster recently reported a fibrocystic tumor of the uterus weighing 87 pounds. Recovery followed

the operation, which was almost wholly performed under local anesthesia. So far as I am able to find in the records this is the largest uterine fibroid to be successfully removed. Adhesions nearly always complicate these large tumors.

FIG. 379



Multiple uterine fibroids. The uterine canal is distorted by two large interstitial fibroids—a pedunculated and a senile fibroid occupies the surface of the uterus, and on the opposite (right) side is a small subperitoneal fibroid. (Specimen removed by Dr. J. Clarence Webster.)

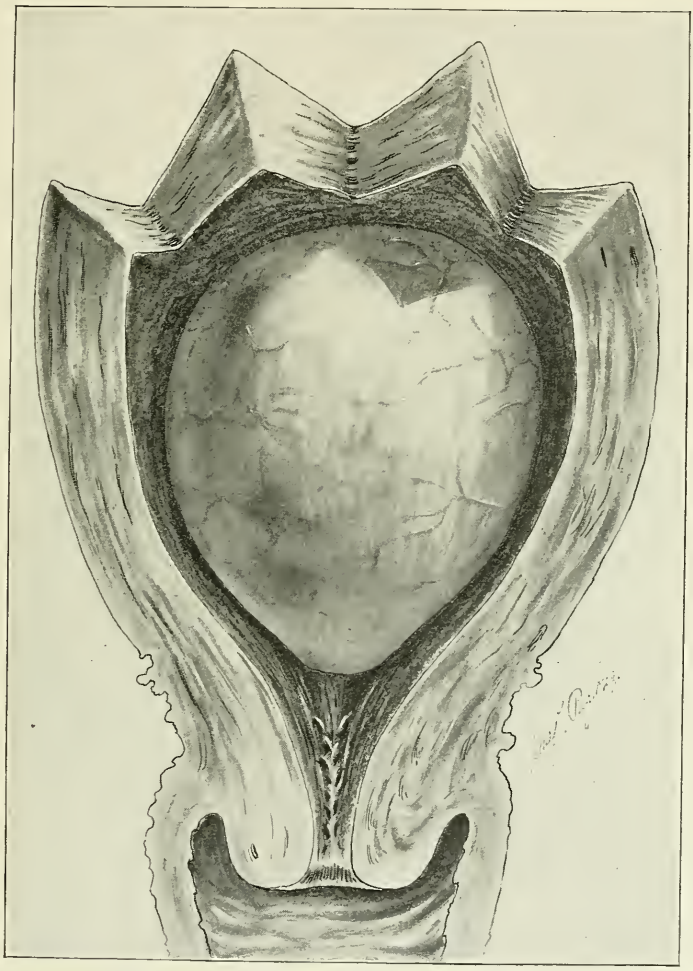
The *form* is smooth and rounded, or, as is more often the case, nodular.

In *consistency* fibroids vary from soft and semifluctuating to a stone-like hardness. Fibroids are classified as hard and soft. Hard fibroids consist largely of fibrous tissue, with a relatively small amount of muscle fiber; the blood supply is not great. Soft fibroids are made up of a relatively large amount of muscle tissue, and are quite vascular.

The *rate of growth* of soft fibroids is more rapid than that of hard fibroids. During pregnancy fibroids grow rapidly. After the menopause they usually decrease in size, though the menopause is often delayed three to ten years. They are seen to grow with surprising

rapidity when undergoing myxomatous degeneration. Scholer estimates that fibroids are seldom distinguishable in less than a year; that in five years they may attain to the size of a man's fist, and in thirteen years to the size of a man's head. However, it is not possible to estimate the age of a tumor by its size. This fact is demonstrated by the many small fibroids which are known to be thirty and forty years of age—"latent fibroids."

Fig. 380

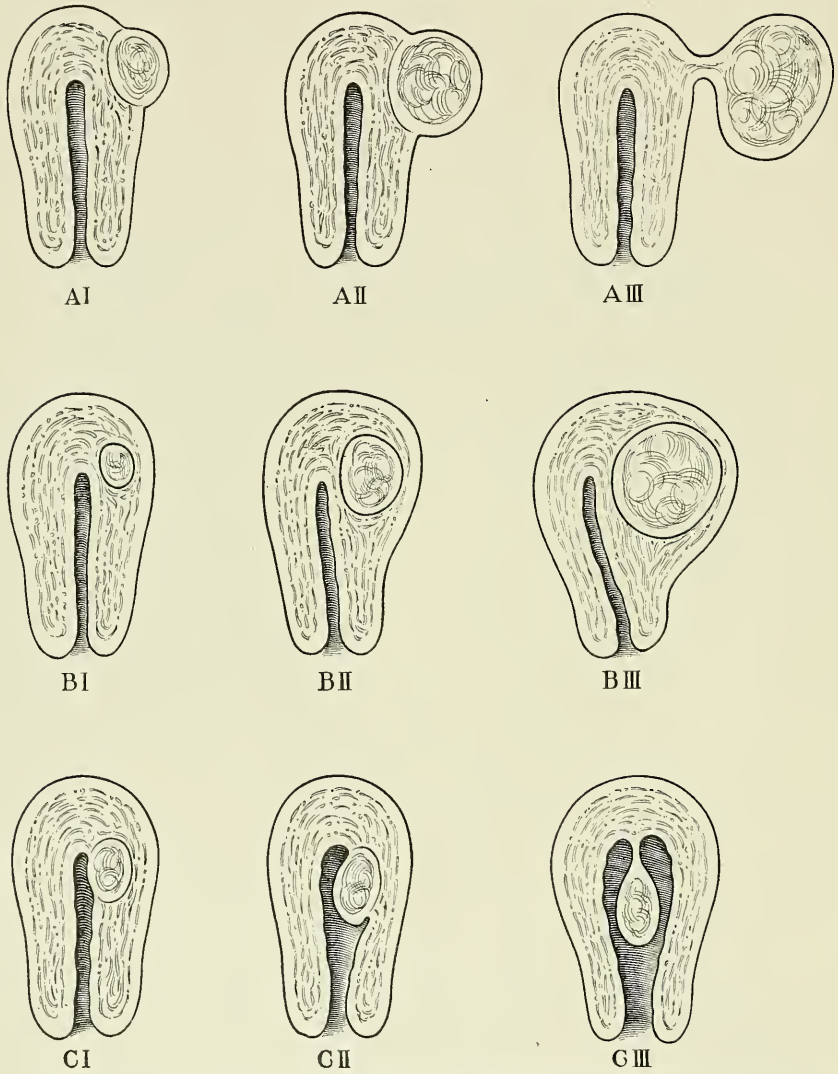


Submucous fibroid of the uterus. The tumor is attached to the posterior wall of the uterus by a broad base. The overlying mucous membrane is atrophied.

It is exceptional for fibroids to exist singly. As many as 400 separate and distinct tumors have existed in the uterus. We speak of fibroids as single or multiple.

According to Martin, the tendency to multiplication increases with the age of the patient.

Fig. 381

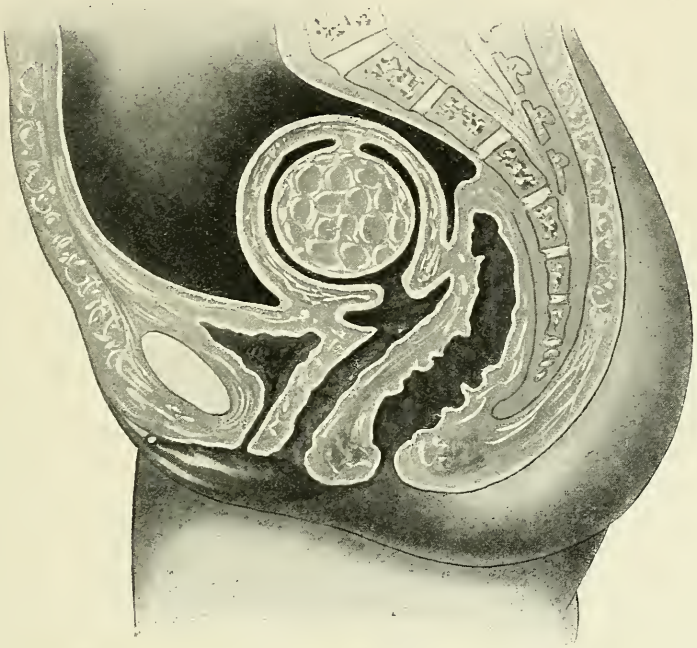


Schematic drawing representing the development of uterine fibroids and their relation to the uterine wall. AI, AII, AIII, subperitoneal fibroids. BI, BII, BIII, interstitial fibroids. CI, CII, CIII, submucous fibroids. (Suggested by Fehling.)

The *position* of fibroids in relation to the uterine wall is of the greatest clinical importance. The terms submucous, intramural or interstitial, and subserous or subperitoneal, are used to designate the location of

the tumor. All fibroids are originally intramural, and as they increase in size they tend to grow in the direction of least resistance. For example, an intramural fibroid lying nearer the endometrium than the perimetrium will eventually become submucous. So long as a fibroid is completely enveloped by the musculature, no matter to what extent, it is intramural; but when the capsule of the fibroid is immediately covered with peritoneum or mucosa it becomes subperitoneal or submucous. When the growth is attached to the inner or outer surface of the uterus, with a broad base, it is known as a sessile growth; when

FIG. 382



Submucous fibroid of the uterus. The uterus is evenly distended by a large fibroid.

the base of attachment is constricted, it is known as a pedunculated growth. The more pedunculated the tumor the slower the growth, because of the limited blood-supply passing through the pedicle. The pedicle when long may so limit the blood-supply to the tumor that atrophy will result. Twisting of the pedicle may completely interrupt the blood supply, in which case the fibroid will usually become gangrenous. If the tumor is adherent to neighboring structures, a requisite supply may be conveyed by the adhesions and prevent necrosis. A partial twist of the pedicle may be followed by atrophy or edema of the tumor.

Spontaneous amputation of the tumor by lengthening or twisting of the pedicle is one of nature's means of effecting a cure in submucous growths.

Fibromyomata of the cervix occur in about 6 per cent. of all uterine fibromyomata.

FIG. 383

Pedunculated submucous fibroid protruding through the cervix. The fibroid protrudes from the cervix as a firm, rounded tumor with a smooth vascular surface. The tumor is attached by a pedicle to the body of the uterus. It is possible for such a growth to be detached and spontaneously expelled. (Specimen removed by Dr. J. Clarence Webster.)

1. **Submucous Fibromyomata.**—Submucous fibromyomata bulge into the uterine cavity and are directly covered with mucous membrane. They are either pedunculated or sessile, single or multiple, and are seldom as large as the patient's head. The pedicle may permit them

to protrude into the cervical canal or farther on into the vagina. They usually possess a relatively large amount of muscle fiber and blood-vessels, and hence are soft in consistency, and their growth is rapid. When large and soft their form is moulded to that of the uterine cavity. They are rarely spherical, but more often elongated. The cervix may constrict them into an hour-glass shape. As the tumor increases in size the overlying mucosa may be atrophied; likewise, the opposing mucosa of the uterus may suffer pressure atrophy, and adhesions may form between the tumor and uterine mucosa. This explains the absence of hemorrhage in many of the large submucous fibroids. Leyden and Küstner described a case in which a fibromyoma, having become detached from the uterus, adhered firmly to the cervix. Partial inversion of the uterus may be caused by traction upon the fundus by a pedunculated submucous fibroid attached to the fundus. The effort on the part of the uterus to expel the fibroid causes the inversion.

2. **Interstitial Fibromyomata.**—Interstitial fibromyomata lie encapsulated within the uterine wall. These growths are rarely distinguished from the uterine musculature (diffuse fibromyomata). When large the growth bulges upon the mucous or serous surface or upon both surfaces. They are usually multiple, and are seldom as firm in consistency as subserous growths.

3. **Subserous Fibromyomata.**—Subserous fibromyomata bulge upon the serous surface of the uterus. They are single or multiple, commonly firm in consistency, though sometimes soft and apparently fluctuating. When pedunculated they may be freely movable or firmly fixed by adhesions which bind the growth to surrounding structures. When located at the side of the uterus the growth may develop between the layers of the broad ligament—intraligamentary or broad ligament fibroids.

Fibroids of the Cervix.—Fibroids of the cervix may be submucous, interstitial, or subserous (subvaginal). Submucous fibroids of the cervix are seldom large. They are usually pedunculated, and as such are known as fibrous polyps.

Interstitial fibroids of the cervix distort the cervical canal, and may cause complete obstruction, locking in secretions above, and preventing conception.

Subserous fibroids of the cervix are very rare, and seldom of large size. They may grow into the vagina or into the paravaginal connective tissue. About 10 per cent. of uterine fibroids occur in the cervix, the balance arising from the uterine body.

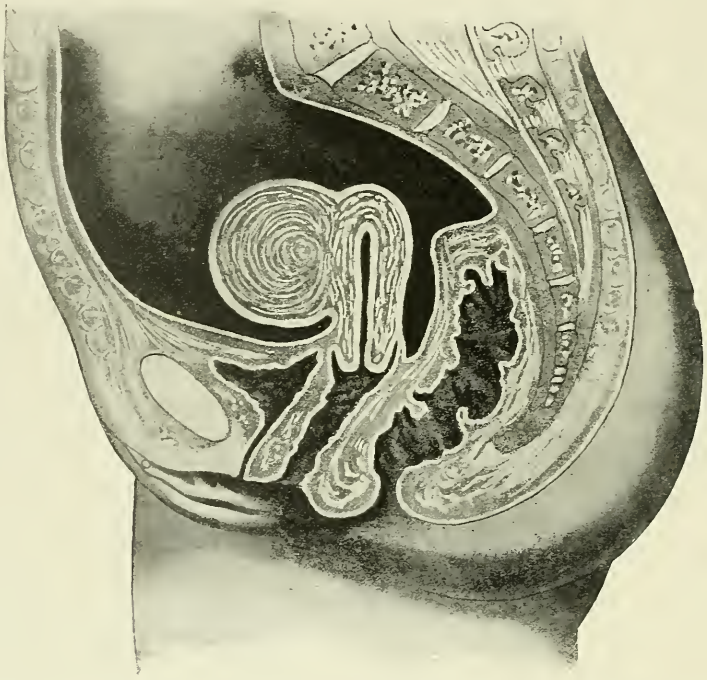
Cervical fibroids are poor in muscular elements and hence are firm and slow in growth. They are prone to undergo cystic degeneration and rarely become calcareous. As they increase in size, the cervix becomes elongated and distorted. Amann described a cervical fibroid weighing twenty-five pounds. Such large fibroids elevate the uterus out of the pelvis.

On cross-section of a fibromyoma bands of fibrous and muscular tissue are seen to run in various directions and form whorls, concentric

rings, and wavy lines. The color varies from gray to a rosy hue, depending upon the relative amounts of fibrous and muscular tissue and upon the blood-supply.

Latent Fibroids.—On cross-section uteri are frequently seen to contain numerous small bodies resembling knots of wood. Such growths are termed "latent fibroids" by Bland Sutton. Their whiteness is in marked contrast to the redness of the musculature. In histological structure they are identical to large fibroids. Undoubtedly a large number of fibroids never develop beyond this stage. Pregnancy exercises a quickening influence upon these latent growths.

Fig. 384



Subperitoneal fibroid of the uterus. The uterus is crowded backward by a fibroid attached to the anterior wall.

Recurrence of Uterine Fibroids.—The so-called "recurrent fibroids," referred to by older writers, are undoubtedly accounted for by the recurrence of what was an unrecognized malignant growth, and secondly by the development of fibroids which were overlooked. Malignant growths are known to start from the stump of an amputated fibroid. This may be called traumatic malignancy, and is not peculiar to fibroids.

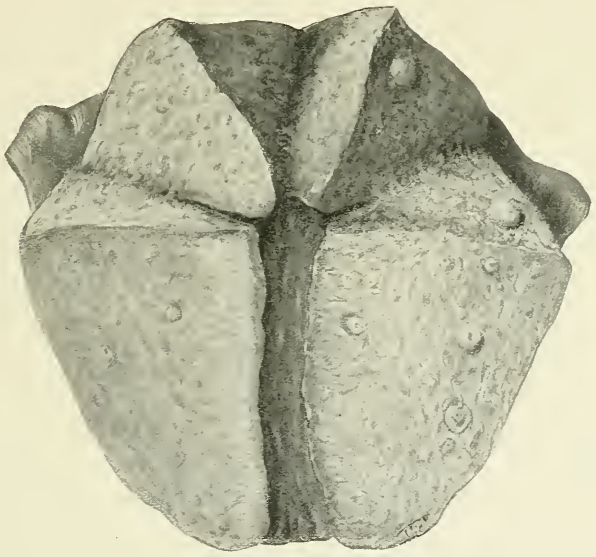
Microscopic Diagnosis.—The microscopic diagnosis is based upon the finding of mature connective tissue and muscle fibers. Without a knowledge of the gross appearance of the tumor it is impossible to

distinguish a fibroid from the uterine wall. The relative amount of connective tissue and muscle fibers varies widely.

A pure fibroid does not exist. There is always present more or less muscular tissue. As age advances the connective tissue increases at the expense of the muscular elements. The muscle fibers are involuntary, and contain spindle-formed nuclei. The cell protoplasm is homogeneous and hardly ever granular. On cross-section the nucleus is half-moon shape. Some fibers contain two or more nuclei. Karyokinetic figures are seldom seen in the muscle cells of the slow developing growths, but are present in proportion to the rapidity of the growth. The connective tissue usually forms a loose texture, poor in nuclei. In associated tumors and in other fields of the same tumor the connective tissue may be more compact and contain round or oval nuclei.

Bloodvessels course through the connective tissue. Veins are not as numerous as arteries, particularly in old fibromyomata. A central artery, running an irregular course through the centre of the fibroid, is described by Gottschalk, but has not been generally recognized. Lorey and Hertz have described nerve fibers in fibromyomata.

Fig. 385



Adenomyoma of the uterus. (Hertzler.)

Adenofibromyoma Uteri.—Fibroids containing glands are described by numerous authorities. Schroeder believes the glands originate in the endometrium. Carl Ruge, Gottschalk, Kossman, and others maintain that they arise from Gärtner's ducts. Recklinghausen contends that the glands arise from the Wolffian body or from the endometrium. These peculiar growths are almost invariably intramural. They never possess a capsule, and are known as diffuse or

infiltrating fibroids. They are found in the tube, the uterine horn, and occasionally in the posterior wall of the uterus.

In 700 cases of uterine fibroids operated in Johns Hopkins Hospital, Cullen reports 19 to be adenofibromata.

Gebhard gives the following varieties:

1. A hard form in which the muscle tissue predominates over the glandular elements.

2. A cystic tumor with many large spaces.

3. A soft form in which the glandular elements predominate over the fibrous or muscular.

4. A soft form with widened blood spaces—telangiectatic or angiomatous adenomyoma.

In the growths are often seen small ducts communicating with a single large one as the teeth of a comb are joined to its back. These ducts are considered by many to be embryonic inclusions of the ducts of the Wolffian body They may distend into cysts and compress the surrounding connective tissue. The contents of the cyst are clear and serous, occasionally colored by pigment.

Recklinghausen speaks of pseudoglomeruli in describing elevations attached to the cyst wall by a broad base.

Pick described a submucous adenomyoma which weighed 55 grams. Cullen reported to the Johns Hopkins Society an adenomyoma of the round ligament.

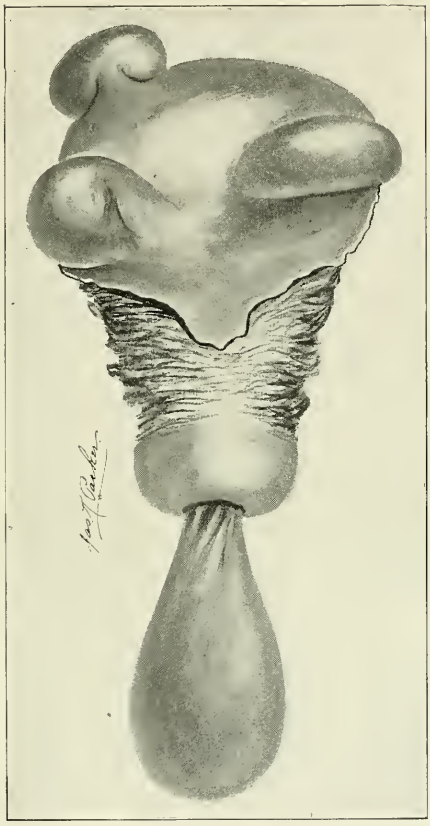
Degeneration of Fibroids.—The following table shows the relative frequency of the various degenerations and complications in the tumor and uterus in 2274 cases of fibroid tumors collected by C. P. Noble:

Carcinoma of the corpus uteri	42 or 1.8 per cent.
Carcinoma of the cervix uteri	16 or 0.7 per cent.
Sarcoma	34 or 1.4 per cent.
Chorio-epithelioma	2 or 0.1 per cent.
Necrosis of the tumor	119 or 4.7 per cent.
Myxomatous degeneration	89 or 3.4 per cent.
Cystic degeneration	58 or 2.5 per cent.
Hyaline degeneration	72 or 3.1 per cent.
Hyaline degeneration and calcareous infiltration	8 or 0.25 per cent.
Fatty degeneration	7 or 0.03 per cent.
Hemorrhagic degeneration	13 or 0.57 per cent.
Calcareous infiltration	39 or 1.7 per cent.
Edema of tumor	17 or 0.74 per cent.
Twisted pedicle	3 or 0.13 per cent.
Dangerous hemorrhage	41 or 1.8 per cent.
Intraligamentous development of tumors	80 or 3.5 per cent.
Subvesicle development of tumor	2 or 0.01 per cent.
Adenomyoma	12 or 0.06 per cent.
Total	664 or 26.49 per cent.

The statistics of Noble, Frederick, Martin, and Cullingworth prove that fibroids of the uterus are by no means the innocent tumors that former writers apparently believed. The various forms of degeneration of fibroids are not only of pathological interest, but their recognition is of the greatest clinical importance.

Noble estimates that serious complications arise in fibroids in about one-third of all cases. Of these complications the various forms of degeneration constitute a large proportion.

Fig. 386



Fibrous polyp of the cervix. The uterus shows senile atrophy together with three small subperitoneal fibroids. The polyp is of unusual size. Such polypoid growths are prone to arise in a senile uterus. They are frequently the cause of hemorrhage in the post-climacteric period.

1. **Atrophy.**—A physiological atrophy of fibroids frequently follows the climacterium. A similar change takes place in the event of an artificially induced menopause by the removal of the ovaries. In pedunculated tumors the blood-supply is limited, and as a result, atrophy may follow. The wasting diseases exercise a staying influence upon the growth of fibromyomata. Atrophy of these growths has been observed to follow abdominal sections, amputation of the breast, and peritonitis. According to Schroeder, this atrophy consists of a fatty degeneration. It is more probably a simple atrophy, in which the

muscle cells diminish in size and in number. In this manner large tumors are said to disappear.

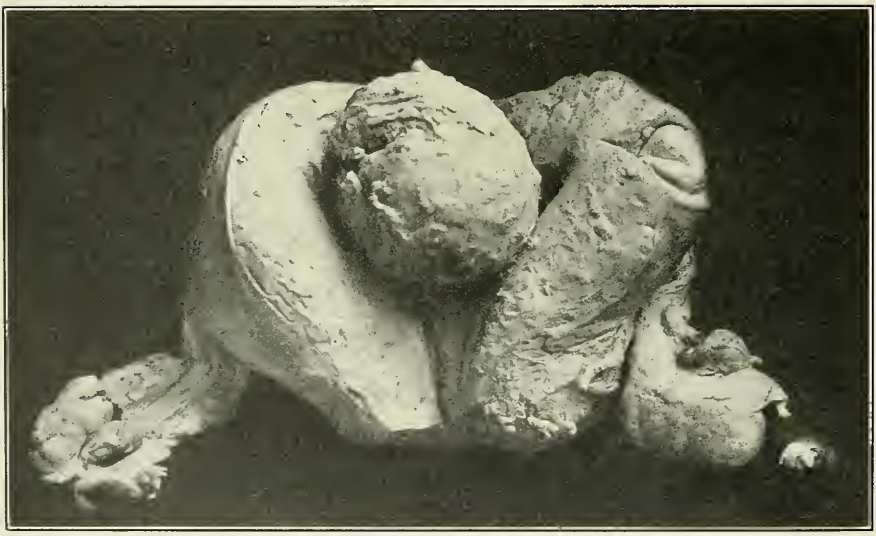
2. **Calcareous Degeneration.**—Calcareous degeneration may occur in fibroids of all sizes and locations. The calcareous deposits are found in the connective tissue, often leaving the muscle fibers isolated and encrusted.

Gebhard gives the following analysis of the deposit.

Calc. carb.	49.0
Calc. phosph.	29.0
Calc. sulph.	13.0
Calc. lithat.	0.5
Organic substances	0.4

Petrified fibroids are known as "womb stones." It is possible for such stones to be severed from the uterus and lie free in the peritoneal cavity, or, if submucous, to be either retained in the uterus or expelled. Womb stones were described by Hippocrates. Everett reported one weighing 2.04 kg. A few weighing twenty pounds have been reported. Chondrification and ossification have also been reported. Advanced age predisposes to this condition.

Fig. 387

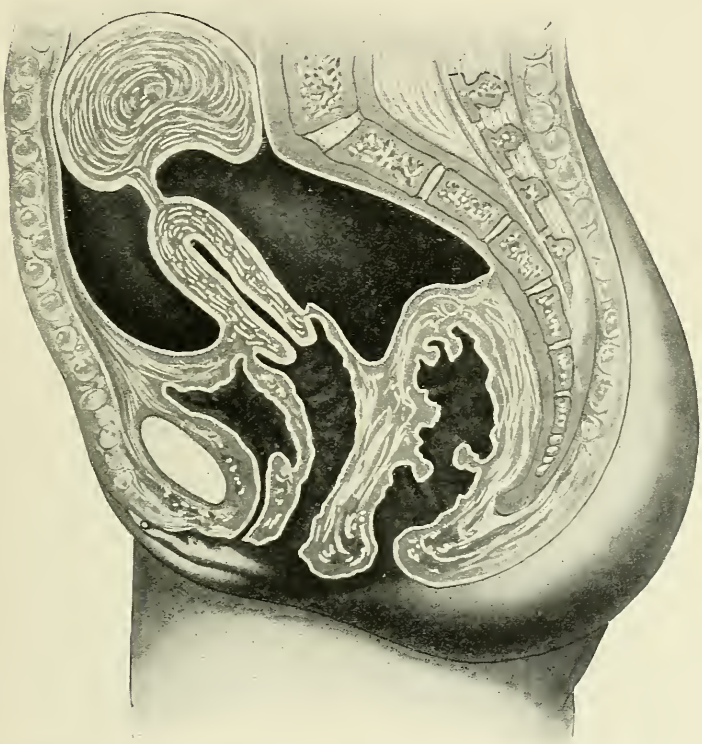


Calcareous myoma of the uterus. (Hertzler.)

3. **Fatty Degeneration.**—Fatty degeneration of fibroids is of common occurrence following pregnancy. The tumor is soft, and of a mottled yellow tint. Fat droplets are seen in the muscle fibers. Such a case was exhibited by Dr. Reuben Peterson before the Chicago Gynecological Society.

4. **Myxomatous Degeneration.**—Myxomatous degeneration of fibroids is a circumscribed degeneration of the connective tissue. There is seldom a diffuse involvement of the tumor. Before cutting into the tumor it may appear cystic. On cross-section one or more areas of degeneration are seen. The myxomatous material is glairy and translucent, containing opaque particles and a fibrillar or fibrous network. By absorption of the myxomatous material cystic spaces are formed.

Fig. 388



A pedunculated subperitoneal fibroid lies above the promontory of the sacrum and is too large to fall into the pelvis. It has drawn the uterus and vagina upward.

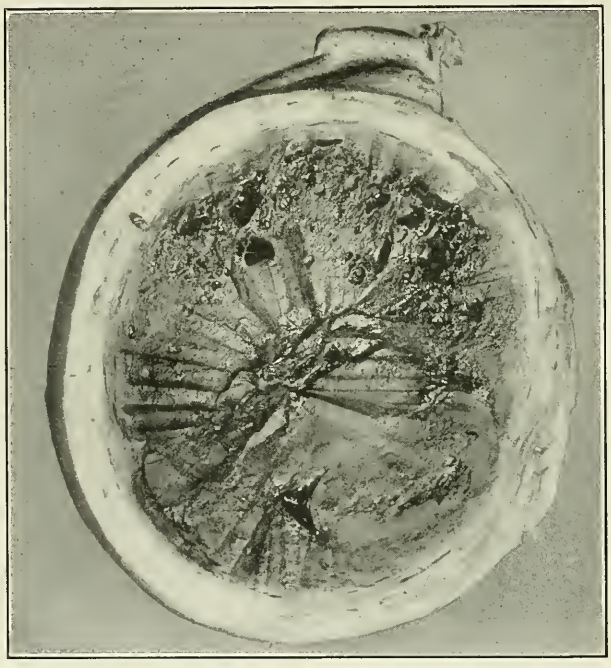
5. **Suppuration and Gangrene.**—Suppuration and gangrene of fibroids is a grave condition, demanding immediate surgical interference. The usual cause is puerperal infection. Subserous fibroids may be infected through the bowel. Twisting of the pedicle of a fibroid may result in gangrene.

6. **Amyloid Degeneration.**—Amyloid degeneration of a fibroid is described by Stratz.

7. **Telangiectatic Fibroids.**—Telangiectatic fibroids are of rare occurrence. They are formed either from a dilatation of the lymph or blood-spaces. The tumor is soft and may fluctuate and even pulsate.

8. **Cystic Degeneration.**—Cysts are found in about 4 per cent. of all uterine fibroids. The subperitoneal, and particularly the pedunculated forms, are especially prone to undergo cystic degeneration. Sixty-three out of seventy cases collected by Heer were subperitoneal. These cysts are usually multiple. They are prone to become infected, in which case the cyst may be converted into an abscess. The contents may be discharged into the peritoneal cavity, with possible fatal results. All of the largest recorded cases of uterine fibroids contain cysts. In the fibrocystic tumor reported and operated by Webster, which weighed eighty-seven pounds, the fluid contents of the cyst

FIG. 389



Hemorrhagic myoma of the uterus. (Hertzler.)

weighed sixty pounds. Peritonitis, hydroperitoneum, intestinal obstruction, and adhesions frequently complicate these cystic growths. We recognize true cysts with an epithelial lining and pseudocysts which are void of an epithelial lining and are formed by the degeneration and absorption of tissue. The true cysts arise from epithelial inclusions from the uterine mucosa, Wolffian and Müllerian tracts. An endothelial lining has been demonstrated by several authorities. The explanation for the origin of these endothelial cysts lies in the lymphatic or blood-canals. The contents of myomatous cysts are clear and colorless, bloody, purulent, or resemble thick pea soup.

9. **Sarcomatous Degeneration.**—Sarcomatous degeneration of fibroids will be discussed in the Chapter on Sarcoma of the Uterus.

10. **Cancerous Degeneration.**—Cancerous degeneration is an unusual form. The epithelial elements are derived from the overlying mucosa in submucous and interstitial growths or from the glandular elements of an adenofibroma. But two cases are recorded in which the cancer began in the substance of the fibroid.

Changes in the Endometrium, Myometrium, Tubes, and Ovaries.—The endometrium commonly undergoes hyperplastic changes under the irritating influence of the fibroid. Hence it is that these changes are almost invariably found in submucous, usually in interstitial, and seldom in subperitoneal fibroids. There is hypertrophy and hyperplasia of the elements forming the endometrium. In large fibroids bulging into the uterine cavity there may be pressure atrophy of the mucosa. When protruding into the vagina the endometrium may be transformed into many layers of stratified epithelium, and decubitus ulcers may form upon the surface.

The myometrium becomes hypertrophied. This is particularly true of submucous and interstitial growths. The hypertrophy is usually proportionate to the size and number of the tumors. Champneys described a case which caused such atrophy of the uterus as to render the musculature scarcely recognizable.

The tubes and ovaries share in the hypertrophy of tissues to a limited extent. It is estimated that the tubes are diseased in 10 per cent. of all cases. The tubes are especially liable to be infected in the presence of infected and sloughing fibroids.

Clinical Characteristics.—1. **Shape.**—A fibroid grows concentrically, and hence is usually round. The firm, subserous tumors, which from their location are less influenced by the uterus, are round or oval. Submucous fibroids of softer consistency are moulded by the uterus. When forced through the cervix they become elongated and even hour-glass-shaped. Interstitial fibroids, confined within the uterine wall, are round.

2. **Mobility.**—Only pedunculated submucous and subserous fibroids move independently of the uterus. Broad ligament fibroids are restricted in their movements. Fixation by adhesions and by incarceration restricts the movements of the tumor and uterus.

3. **Consistency.**—The consistency of a fibroid varies from a stone-like hardness to the softness of a pregnant uterus, and may even appear to fluctuate. This variation in consistency is largely to be accounted for by the relative proportions of fibrous and muscular tissue comprising the growth. The more fibrous the tissue, the harder the growth. The forms of degeneration causing a hardening of the growth are atrophy (so-called fibroid degeneration), calcareous, cartilaginous, and osteomatous degenerations; those causing a softening of the fibroid are fatty, myxomatous, cystic, edematous, purulent, gangrenous, telangiectatic, sarcomatous, and cancerous degenerations. During pregnancy the tumor softens and grows rapidly; after pregnancy it becomes smaller and

firmer. During the period of menstrual congestion the growth increases slightly in size and is more elastic.

4. **Rate of Growth.**—The softer and more vascular the tumor, the more rapid its growth. It is important to observe the rate of growth in distinguishing a growing fibroid from a pregnant uterus and in determining malignant degeneration.

Clinical Diagnosis.—The diagnosis of uterine fibroids rests largely upon the local findings. Symptoms at best are only suggestive of their possible presence.

Symptoms—Two general groups of symptoms are to be considered: those due to hemorrhage, and those due to pressure and traction made by the growing tumor.

1. *Hemorrhage,* in the form of an increase of the menstrual flow, is usually the first event that attracts the attention of the patient. An excessive menstrual flow, beginning late in the childbearing period and associated with dysmenorrhea, suggests the probable presence of uterine fibroids. As time goes on the loss of blood may seriously undermine the patient's health, and has been known to cause death. There may be no intermission, or intervals of variable length may be interrupted by profuse and even alarming hemorrhages. It is seldom that the loss of blood is distinctly and exclusively intermenstrual. The blood comes from the endometrium, rarely from the fibroid. The tumor acts as a foreign body irritating the endometrium. Hence it is that hemorrhage occurs almost invariably in submucous fibroids, to a lesser extent in interstitial, and seldom in subperitoneal fibroids. It is possible for a subperitoneal growth to interfere with the circulation in the uterus and indirectly cause hemorrhage. Mental excitement, physical exertion, and instrumental and digital examinations may excite hemorrhage. The blood is often expelled in clots. This clotting is partly the result of obstruction to the outflow of blood by the tumor and by displacement of the uterus.

2. *Pressure* and *traction,* made by the growing tumor upon surrounding structures, are later developments than hemorrhage, and are not usually manifest until the tumor has attained considerable size. Subperitoneal growths are most likely to produce these symptoms. A variety of symptoms arises from direct pressure and traction. Pain is caused by pressure of the growing uterus and tumor upon the various structures in the pelvis. A fibroid tumor incarcerated in the small pelvis may early cause pain, sometimes to an intolerable degree. Intraligamentary fibroids no larger than a man's fist may occasion distressing pain. On the other hand, large, freely movable fibroids, occupying the abdominal cavity, may cause no pain. The pain is commonly located in the lumbar and sacral regions, the shoulders, breasts, and thighs, and occasionally in the cervical and interscapular regions.

In submucous growths the pain may be due to intermittent uterine contractions, excited by the growing fibroids. Such pains are usually colicky, and are most severe during the period of menstrual congestion. If, as sometimes happens, the outflow of menstrual blood is obstructed,

there will be a so-called obstructive dysmenorrhea, due to intra-uterine tension and to an effort on the part of the uterus to expel the blood-clots. Pain, in most cases of uterine fibroids, first manifests itself at the menstrual period, when the uterus and tumor are swollen and sensitive from congestion.

The "birth of a fibroid"—*i. e.*, the expulsion of a submucous fibroid—is often associated with labor-like pains of astonishing severity. After the flow is well started the pain may be relieved. The more abundant the blood-supply to the tumor, the greater will be the menstrual swelling. Acute pain on external pressure may be experienced in the menstrual period from irritation of the peritoneum. Mechanical irritation of the peritoneum caused by the movable tumor may set up a localized peritonitis, and this in turn adds to the pain and discomfort.

Pressure of a fibroid upon the abdominal and thoracic viscera gives rise to a variety of symptoms. Pressure upon the bladder causes vesical tenesmus, frequent urination, and catarrh of the bladder. A small, subperitoneal fibroid attached to the anterior surface of the uterus may cause serious disturbance in the bladder. The ureters may be compressed, leading to hydronephrosis, pyonephrosis, and uremia. The urethra is rarely pressed upon by the tumor, though the bladder may be elevated and the urethra stretched and distorted.

Pressure upon the rectum may cause constipation, rectal tenesmus, a sense of fulness and pressure in the rectum, and a catarrhal discharge from the bowel.

Pressure upon the veins of the pelvis may cause edema and varicosities of the lower extremities.

When the tumor is sufficiently large to fill the abdominal cavity, pressure upon the bowel and stomach will interfere with digestion, and pressure upon the diaphragm will hinder its excursions, and thereby interfere with the functions of the heart and lungs. Great intra-abdominal pressure caused by large fibroids undoubtedly embarrasses the functions of the kidneys.

Torsion of the pedicle of a fibroid is possible; furthermore, it is possible for a fibroid to cause torsion of the uterus. In this manner a fibroid may be completely twisted from the uterus. Such an event must necessarily be followed by gangrene of the tumor, unless an adequate blood-supply is conveyed by the adhesions. Immediately upon the twisting of the pedicle there is severe abdominal pain, together with a sudden increase in the size of the fibroid. Vomiting and collapse follow—the clinical picture being not unlike that of a strangulated hernia, or the twisted pedicle of an ovarian cyst. When the torsion is partial or slow in its development, the symptoms will be less pronounced. When a fibroid becomes infected or gangrenous, the event will be ushered in by a rise in temperature, chills, and pain. The tumor will be tender to pressure and increased in size. When submucous, a stinking discharge will come from the uterus. When a subperitoneal fibroid becomes gangrenous the symptoms are less characteristic. Pain may be absent. Rise of temperature and tender-

ness on pressure are all but constant symptoms. The usual signs of peritonitis supervene when the infection spreads to the peritoneum.

Calcareous degeneration gives rise to no symptoms suggestive of the condition. There is but one sign upon which a positive diagnosis can be based, and that is the expulsion of part or all of the growth in which the calcareous deposits are found. This is not of frequent occurrence because submucous fibroids rarely calcify and under such circumstances are seldom expelled.

Objective Signs.—It is evident that a positive diagnosis cannot be made from the above subjective signs. From them we can only conclude that there is a swelling of some sort causing pressure symptoms. A physical examination is indispensable in making a diagnosis.

The diagnosis is based upon the recognition of a tumor connected with the uterus and having fairly definite characteristics. The recognition of a fibroid of the uterus is ordinarily easy, but may be rendered difficult by various circumstances. In order that a diagnosis of fibroids may be made, the tumor must either be seen or outlined by the examining hands. Many conditions may exist to render such a procedure impossible, and at such times the diagnosis must be reserved until an examination is made under anesthesia or an exploratory incision has been made.

Small interstitial fibroids can only be suspected from the size and irregular consistency of the uterus. In large, interstitial fibroids there is difficulty in outlining the uterus apart from the tumor. The sound passed into the uterine cavity will locate the uterus, and when combined with a conjoined examination, it should be possible to determine the existence of a fibroid and its position relative to the uterus. In outlining the respective positions of the uterus and tumor it is important to recognize the differences in their form and consistency.

A subperitoneal fibroid is ordinarily identified by a conjoined examination. When the tumor is large, abdominal palpation may alone be sufficient. The form, consistency, and relation to the uterus may suffice for a diagnosis. Much dependence may be placed upon the firmer consistency of the tumor as compared with the uterus, and particularly is this of importance in differentiating a fibroid from a pregnant uterus.

As with interstitial fibroids, great difficulty may be experienced in outlining a large, sessile, subperitoneal fibroid from the uterus. The irregular outline, the firmer consistency, the groove or angle which may mark the connection between tumor and uterus, are points which, together with the use of the sound, should suffice for a diagnosis in the majority of cases. Greater difficulty is experienced with multiple subperitoneal fibroids.

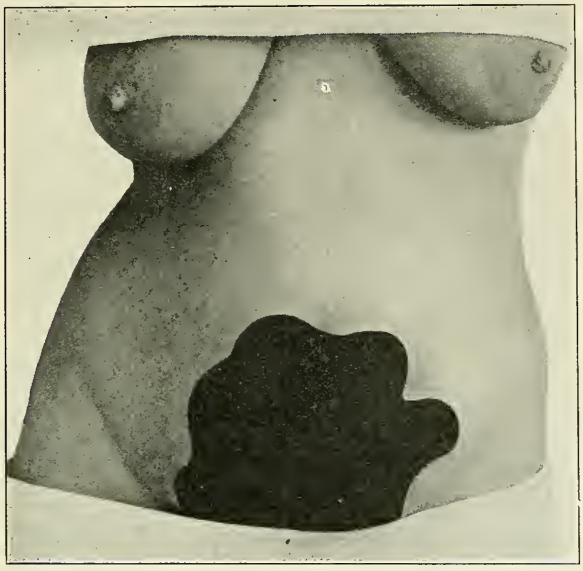
In large fibroids a vascular souffle is often heard and may be mistaken for the souffle of pregnancy. The pulsations of the aorta may be transmitted through the tumor and be mistaken for the fetal heart-beat.

Intraligamentary or broad ligament fibroids are recognized by their

point of attachment along the side of the uterus, by their lessened mobility, by the course of the adnexæ which run over the tumor, and by the crowding of the uterus to the opposite side of the pelvis. The growth may spring from the supravaginal portion of the cervix or from the side of the uterine body.

Plate IV represents a single, large, subperitoneal fibroid causing a rounded protuberance of the abdomen. Plate V represents an abdomen distended by multiple subperitoneal fibroids, in which the irregularities are plainly visible.

Fig. 390



Area of dulness in multiple fibroid of the uterus.

Submucous fibroids can only be diagnosticated with certainty when they are seen protruding through the cervix or when palpated through the cervical canal. The hemorrhage and uterine colic will suggest the possible presence of a submucous fibroid, but the diagnosis must be kept in reserve for a physical examination. Within the uterine cavity the finger detects a firm, rounded tumor connected with the uterus by a broad base or pedicle. The fibroid may be felt as a circumscribed tumor bulging upon the mucosa. With the sound or curet similar observations may be made, though with less certainty.

Fibroids of the cervix are not difficult to diagnosticate when attached to the vaginal portion. Their attachment to the cervix can be demonstrated by inspection or by the finger and sound. Small interstitial fibroids of the cervix are recognized by the firm, rounded, and sharply circumscribed area of resistance which characterizes their presence.

The use of the sound in the diagnosis of uterine fibroids is not to

be underestimated, yet its application should be restricted to the cases in which a conjoined examination fails to clear up the diagnosis. Aside from the danger of infection there is the added risk of perfor-

Fig. 391

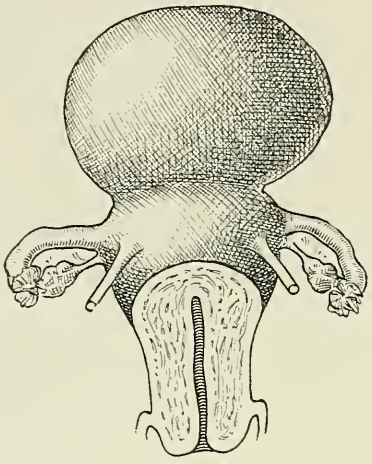


Fig. 392

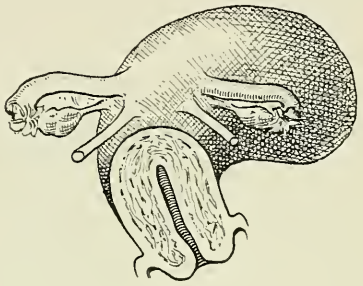


Fig. 393

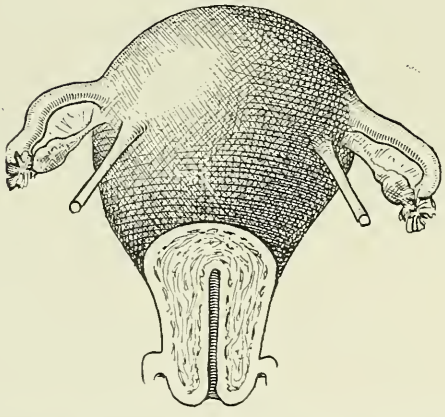
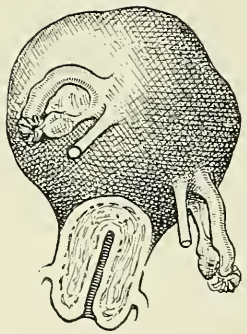


Fig. 394



It is sometimes possible to locate a fibroid in relation to the uterus by palpating the uterine appendages and round ligaments.

Fig. 391. The fibroid is subperitoneal and sits upon the fundus, hence the appendages and round ligaments are not disturbed in their relative positions. Fig. 392. The fibroid is subperitoneal and sits upon the posterior wall of the uterus, and extends backward and to the left. The appendages and round ligaments are not disturbed in their relative positions. Fig. 393. The fibroid is interstitial and evenly distends the uterus, hence the appendages and round ligaments are separated on the same plane. Fig. 394. The fibroid is interstitial and lies in the fundus and right cornua. The right tube and round ligament are elevated and dislocated outward.

ating the uterus at a point thinned by the tumor. Great difficulty may be experienced in the passage of the sound. The tumor may be impinged upon and give the impression that the depth of the uterus is short in contrast to the usual lengthening of the uterine cavity, as found

in the presence of submucous and interstitial fibroids. The shape of the uterine cavity is also to be noted by the sound. It may be encroached upon and greatly distorted, so much so that the uterine sound cannot be passed to the fundus.

Palpation of the Adnexæ and Round Ligaments.—In favorable cases the tubes and round ligaments can be palpated by a conjoined examination. It is observed that their location and points of attachment are altered by the tumor, and it is sometimes possible to locate the tumor in its relation to the uterus by observing the position of the adnexæ and round ligaments.

When the uterus is small and a large fibroid rests upon the fundus, the tumor may be mistaken for the uterus. The attachment of the tubes and round ligaments, when determined, will indicate the position of the uterus apart from the tumor. The sound will confirm the findings.

A submucous or interstitial growth, evenly distending the uterus, will separate the attachments of the round ligaments and adnexæ. An interstitial fibroid of the anterior wall will separate the round ligaments and tubes, and if it be to one side of the median line, the corresponding tube and round ligament will be elevated above the other. An interstitial fibroid on the posterior surface of the uterus will tend to approximate the appendages. If the fibroid is on the side of the uterus the corresponding round ligaments and tube may be elevated. Figs. 397 to 400 illustrate these facts. The diagnosis of malignant degeneration of a fibroid is discussed in the chapter on Sarcoma of the Uterus.

Differential Diagnosis.—Fibroids of the uterus commonly appear during the period of sexual maturity when pregnancy, inflammatory lesions, and displacements are liable to arise, and it is for this reason that the differential diagnosis is of such importance.

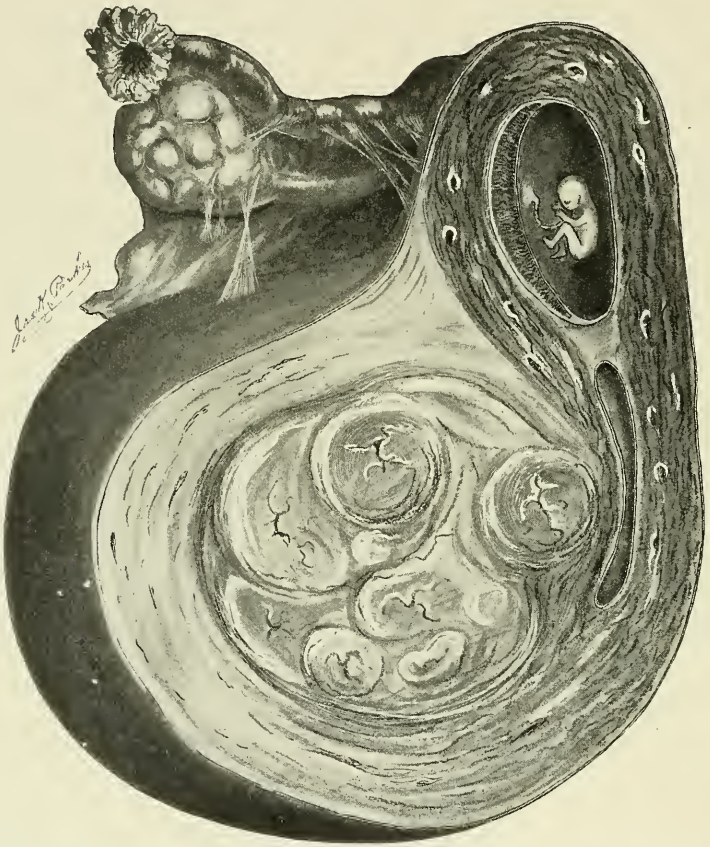
Interstitial Fibroids	Chronic Metritis
1. Irregular enlargement of the uterus unless tumors are small.	1. Uniform enlargement.
2. Variable consistency.	2. Uniform, firm consistency.
3. Not tender to pressure.	3. Commonly tender to pressure.
4. Uterus freely movable.	4. Uterus usually restricted in its movements.
5. No history of infection.	5. History of infection.
6. Symptoms of uterine catarrh not common.	6. Symptoms of uterine catarrh generally present.

When the fibroids are multiple and small it may be impossible to distinguish such a lesion from chronic metritis. The clinical history cannot be relied upon.

Uterine Fibroids	Uterine Pregnancy
1. Usual signs of pregnancy absent.	1. Present.
2. Tumor of firm consistency, rarely soft.	2. Soft and elastic.
3. Intermittent uterine contractions absent.	3. Present.
4. Irregular and asymmetrical growth.	4. Rate of growth regular and symmetrical.
5. Slow growth.	5. More rapid growth.
6. Cervix firm, not patulous.	6. Cervix soft and patulous.
7. Positive signs of pregnancy absent.	7. One or more present, *i. e.*:
	a. Fetal heart tones.
	b. Placental bruit.
	c. Active fetal movements.
	d. Palpation of fetal parts.
	e. Ballottement.

Of greatest importance in the differential diagnosis of fibroids from early pregnancy is the uniform, rapid growth of the pregnant uterus, the intermittent uterine contractions and characteristic doughy consistency of the uterus. Later, when positive signs of pregnancy are elicited, there should be no mistaking the fact of pregnancy.

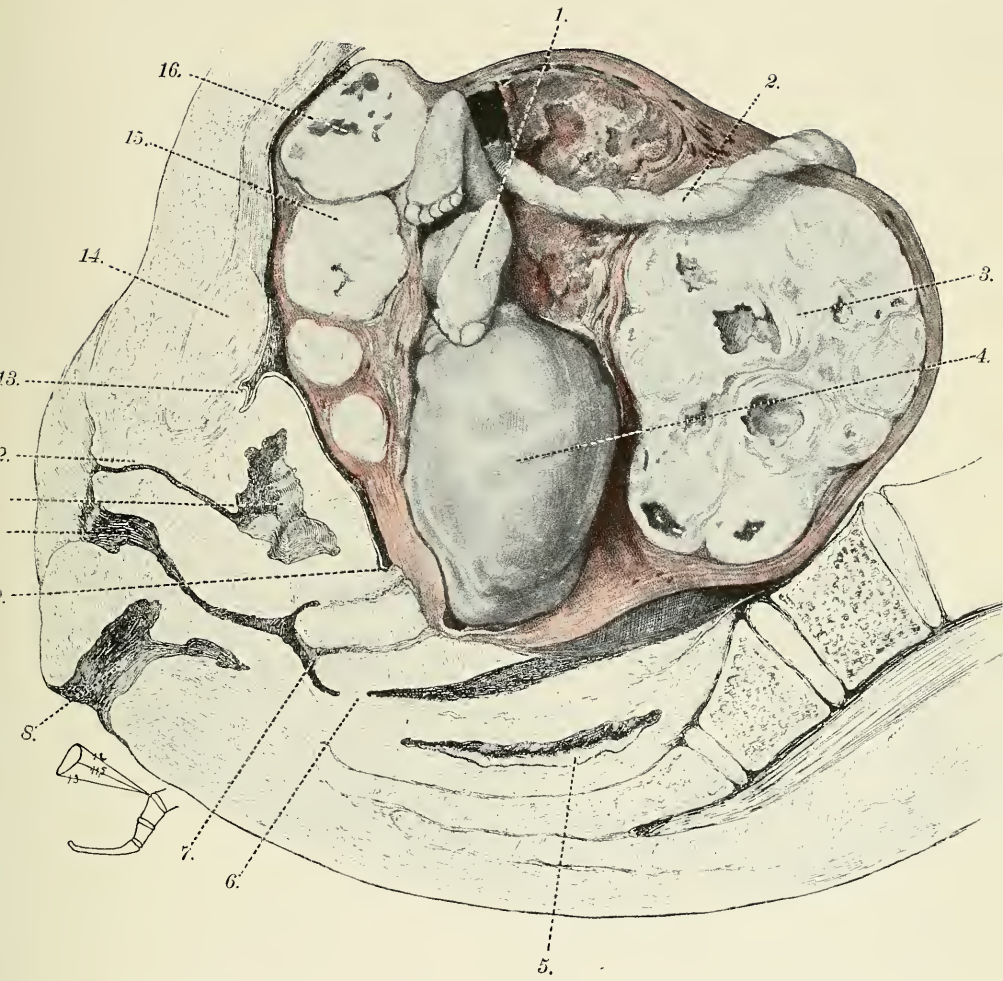
Fig. 395



Subperitoneal fibroid of the uterus in the third month of pregnancy. On the posterior surface of the body of the uterus and cervix is a hard subperitoneal fibroid, the size of a fetal head. The uterine wall is abnormally thickened. The ovary is cystic and adherent to the tube and uterus. (Specimen was removed by Dr. J. Clarence Webster.)

A large, soft, interstitial fibroid may evenly distend the uterus. Its soft consistency, regular outline, and rapid growth may suggest the presence of a pregnant uterus. In addition to the above findings there may be nausea and vomiting, enlargement of the breasts, and softening and discoloration of the vaginal portion of the cervix. With such a condition it may be impossible to differentiate from early pregnancy. Keeping the case under observation for a few weeks, it will be noted

PLATE XXVI

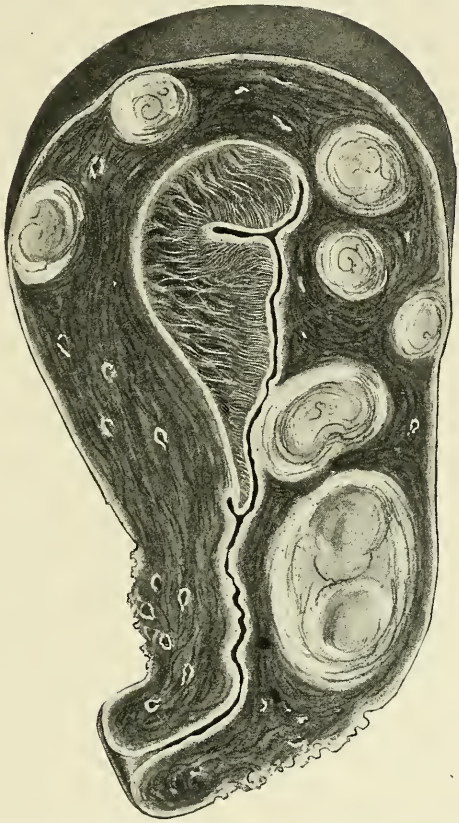


Pregnant Myomatous Uterus. Medial Section of Pelvis.
(Leipmann.)

1. Foot of fetus.
2. Umbilical cord.
3. Fibroid in posterior wall of uterus.
4. Head of fetus.
5. Rectum.
6. Recto-uterine fold.
7. External os.
8. Anus.
9. Vesico-uterine fold.
10. Vagina.
11. Urinary bladder.
12. Urethra.
13. Peritoneum.
14. Os pubis.
15. Fibroid in anterior wall of uterus.
16. Necrotic area in fibroid.

that the growth is slower than in pregnancy, that there are no intermittent contractions, and that none of the positive signs of pregnancy develops.

Fig. 396



Multiple interstitial fibroids in a full-term pregnant uterus. The placenta is retained in situ. The irregular contractions of the uterus, due to the presence of the fibroid tumors, are shown by the irregular course of the uterine cavity. (The uterus was removed by Dr. J. Clarence Webster immediately following a Cesarean section.)

The diagnosis of fibroids complicated by pregnancy is often a difficult problem. Small, subperitoneal fibroids may be mistaken for part of the fetus. Under the influence of pregnancy a fibroid usually grows rapidly and becomes soft. It is, however, unusual for the growth to become as soft as the pregnant uterus, so by the circumscribed area of firmer resistance, the fibroid is outlined apart from the pregnant uterus. If the examination is made during a uterine contraction, this difference in consistency between the uterus and fibroid is not evident. Repeated and prolonged examinations may be required.

No tumor other than a pregnant uterus displays these intermittent contractions.

When, through a morbid state of the contained fetus, the uterus remains in a condition of tonic contraction, the discovery of an interstitial fibroid may be impossible. When in doubt as to the diagnosis, and the condition of the patient does not demand immediate interference, it is always advisable to await developments and make examinations at frequent intervals.

Subserous Uterine Fibroids	Hematoma and Hematocele
1. No history of recent pregnancy.	1. Frequently history of previous pregnancy.
2. Slow, continued development.	2. Sudden development.
3. Consistency firm, rarely soft.	3. Consistency at first is fluctuating, later is doughy.
4. Sharply circumscribed tumor.	4. Ill-defined tumor.
5. Exploratory puncture negative.	5. Exploratory puncture—blood obtained.

Gangrene with fatal termination has been known to follow an exploratory puncture of a fibroid. It is not always possible to remove blood through an exploratory needle because of the firm clotting. In this event an exploratory incision must be substituted.

For the differential diagnosis of uterine fibroids from displacements of the uterus, carcinoma, sarcoma, tubal and ovarian swellings, and pelvic exudates, see respective chapters on these subjects.

A case in the experience of the author, and another observed by Bayard Holmes, presented a soft subperitoneal fibroid near the horn of a pregnant uterus which was thought to be an ectopic gestation. In both cases the pregnancy was early; the fibroids were not discovered until the pregnant uterus began to rise out of the pelvis, bringing the softened tumor with it.

Fibroids Imperil Life.—Fibroids may exist without the knowledge of the individual carrying them. Again, they may be the source of much distress, and may be the direct or indirect cause of death. The following are the incidents which seriously influence a myomatous patient:

1. *Hemorrhage.*—Hemorrhage is the most common, though not the most serious, event. Little need be added to what has already been said. While the patient's health may be seriously influenced by loss of blood, it must be remembered that this is not alone the result of a loss of large quantities of blood. What may appear to be an insignificant amount, when continued over many months and years, may produce a chronic anemia, not unlike pernicious anemia in its clinical features. Excessive bleeding from a fibroid during and between menstrual periods usually indicates septic infection of the tumor.

2. *Complicating Pregnancy.*—The gravity of fibroids complicating pregnancy depends in great part upon the size and position of the tumor. Submucous fibroids have the most serious influence and subperitoneal the least.

A submucous fibroid predisposes to abortion, interferes with the complete emptying of the uterus, and hence renders the patient liable to infection and hemorrhage. Septic infection and sloughing of these growths may follow. Subperitoneal fibroids may become edematous

or infected and lead to peritonitis. Twisting of the pedicle of a subperitoneal fibroid is an occasional accident which leads to severe pain, gangrene of the tumor, and peritonitis. In the Baudelocque, 1895 to 1900, there were 85 cases of uterine fibroids complicated by pregnancy. Méneut reports 67 of these having gone to full term and 13 aborted; in 2 cases abortion was induced, and death occurred in 2 cases.

Tait found in the literature 39 cases of polypoid myomata complicating pregnancy. Of this number gangrene of the tumor occurred in 6, spontaneous expulsion of the fetus together with much loss of blood in 3, myomectomy in 7, normal delivery in 10, maternal deaths in 8.

3. *Septic Infection.*—Septic infection is a most serious complication and demands immediate and radical treatment.

The infection may be conveyed to the fibroid by instruments and fingers. More often it arises through an infected puerperal wound of the uterus. Tumors adhering to the bowel may be infected from the bowel. A submucous fibroid, protruding through the cervix into the vagina, may be so constricted as to partly shut off the blood supply and lead to edema and congestion, which may later result in gangrene of the fibroid with all its remote consequences.

4. *Torsion of the Pedicle.*—A long, slender pedicle of a subperitoneal fibroid may permit of rotation of the fibroid in exactly the same manner as in ovarian cysts. The accident is a rare one. Conditions which favor rotation of the fibroid are a long, slender pedicle, free fluid in the abdomen, sudden increase in the intra-abdominal pressure, pregnancy, the sudden emptying of the pregnant uterus, and lastly, direct injury. The consequences of such twisting are gangrene of the fibroid, followed by peritonitis unless surgical interference is timely. Calcareous fibroids have twisted off and have been found free in the abdominal cavity, but giving rise to no disturbances.

5. *Impaction.*—Impaction in the small pelvis may occur from all varieties of fibroids, but it is far more common in subperitoneal fibroids. This event is especially liable in pregnancy, at which time the tumor and uterus grow rapidly. Retention of urine may be caused by direct pressure upon the urethra. Frequent urination results from pressure upon the bladder. When long continued the bladder and kidneys may suffer permanent injury. Bland Sutton lays down the rule that "when a woman between thirty-five and forty-five seeks relief because she suffers from retention of urine for a few days preceding each menstrual flow it is almost certain that she has a fibroid in the uterus." Broad ligament fibroids are especially liable to impaction, and the pressure exerted by them upon the ureter, pelvic nerves, and bloodvessels may early become serious.

6. *Intestinal Obstruction.*—Intestinal obstruction may arise from direct pressure of the growth or from the entanglement of the intestinal loops with the pedicle of a subperitoneal fibroid.

7. *Nutritive Changes.*—Nutritive changes in the fibroid may imperil life. Fibroids grow almost invariably during the period of gestation, and particularly in the early months. The increase in the size of the

tumor may be so rapid and attain such a large size as to seriously embarrass not only the course of pregnancy and labor, but also the functions of the abdominal viscera.

During labor, degenerative changes may occur in the fibroid as the direct result of trauma. Such tumors are usually located low in the pelvis. According to Hammarschlag these changes are not necessarily dependent upon trauma, but may arise independent of injury. It must be admitted that fibroid tumors of the uterus, even of large proportions, seldom impede the progress of labor. Statistics from the large clinics of the world justify this assertion.

During the lying-in period the usual tendency of fibroids is to undergo involution, even to the point of apparently disappearing. Hammarschlag finds that the sudden cessation of the free blood supply which exists during pregnancy sometimes brings about marked necrotic changes in the tumor which may seriously affect the patient.

Edema of the tumor may occur during pregnancy, labor, and in the lying-in period. During pregnancy such an event must be looked upon as a fortunate happening, inasmuch as the softening of the tumor permits of such moulding of the growth by the pressure of the advancing child that delivery will be favored.

Hemorrhage from the severing of adhesions may arise during the latter part of pregnancy and in labor. Fatal results have been recorded. This event is especially liable to occur when artificial reposition is attempted. Hemorrhage and peritonitis have been known to result from the twisting of the pedicle of a subperitoneal fibroid. Expulsion of a submucous fibroid during labor and the puerperium is a not infrequent event, and may be followed by serious infection.

8. *Cardiopathy of Uterine Fibroids.*—Cardiopathy of uterine fibroids is a condition demanding serious consideration because of the gravity of the condition and its frequent occurrence. Various functional and organic lesions of the heart are found to be associated with uterine fibroids in about 40 per cent. of cases, not simply as a coincidence but as an inevitable result in some cases. It is therefore imperative to look to the heart in all cases.

McGlinn draws the following conclusions from his study of a large number of autopsies:

First. A definite entity of a fibroid heart cannot be sustained.

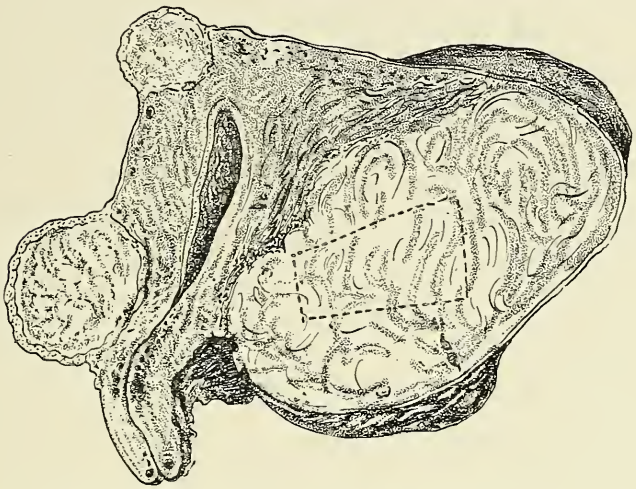
Second. If the fibroid tumors of the uterus were the cause of all heart lesions then every tumor, regardless of its size and situation, should be removed. A contention that the most radical would hardly admit.

Third. Uterine myomata, occurring in middle and advanced life, are practically always associated with sclerotic heart lesions. These lesions are a part of a general process and bear no relation to the fibroid.

Fourth. Large tumors, by increasing the work of the heart, and tumors causing pressure on the pelvic circulation may produce hypertrophy and secondary dilatation of the heart.

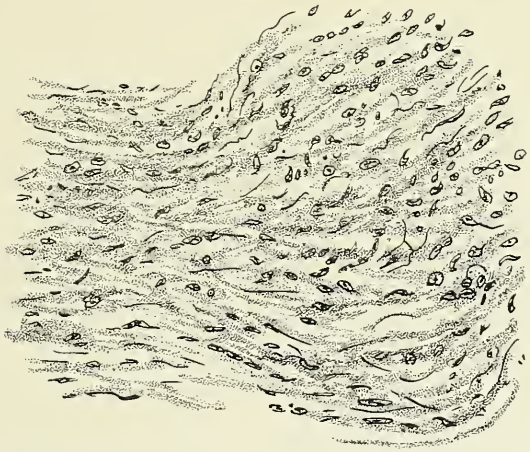
Fifth. Anemia from hemorrhages, infections, and certain degenerations of the tumor may affect the heart, secondarily causing changes, such as fatty degeneration, brown atrophy, and cloudy swelling.

Fig. 397



Multiple fibroids of the uterus, with sarcomatous degeneration.

Fig. 398



Spindle-cell sarcoma. Section taken from centre of a large fibroid in Fig. 395.

Sixth. The majority of cases of fatty degeneration, brown atrophy, cloudy swelling, myocarditis, etc., found in connection with fibroid tumors of the uterus, are not caused by the tumor but by conditions entirely foreign to the tumor.

9. *Malignant Degeneration.*—Malignant degeneration of uterine fibroids occurs in 3 to 4 per cent. of all cases, according to Winter. These changes are almost invariably sarcomatous.

Coincident malignant disease of the uterus with fibroids has been frequently observed, but to establish a relationship of cause and effect is not justifiable. The fact that they occasionally occupy the same uterus should lead to the consideration of the possible existence of the two lesions in all cases.

Causes of Death from Uterine Fibroids.—Pellanda tabulates the causes of death in 171 cases of uterine fibroids as follows:

1. Cachexia, 9 cases, or 5.2 per cent.
2. Hemorrhage, 11 cases, or 6.4 per cent.
3. Infection, 85 cases, or 49.5 per cent. The majority were dependent on labor and abortion followed by infection.
4. Compression of abdominal and pelvic viscera, 44 cases, or 25.8 per cent.
5. Thrombosis of the pelvic veins followed by pulmonary embolism; also cardiac lesions and sudden syncope, 19 cases, or 11.1 per cent.
6. Torsion of pedunculated subserous fibroid, 3 cases.

More patients die from postoperative complications than from the tumor itself.

Effect of Fibroid Tumors upon Neighboring Organs.—By compression of neighboring organs, fibroid tumors create circulatory disturbances in these organs and so compress and distort them as to give rise to serious functional disturbances. The bladder, rectum, ureters, and urethra suffer greatest from compression. The bladder may be elevated to the level of the umbilicus. The urethra may be greatly elongated, and compression of the urethra may lead to retention of urine within the bladder. Hydro-ureter and hydronephrosis, with possible destruction of the parenchyma of the kidney, may result from compression of the ureters. Intraligamentary fibroids are prone to distort and displace the ureter. Compression of the rectum may give rise to constipation, distention of the bowel above the point of compression, and to hemorrhoids. Complete obstruction probably never occurs.

Effect of Fibroid Tumors upon the Blood.—Noble reported a case with 10 per cent. of hemoglobin and another with 15 per cent. The anemia may be so profound, as the result of the hemorrhages, as to produce permanent invalidism, and is known to result fatally. Telanda, in a report of 171 cases of death from fibroids without operation, records a mortality of 6.4 per cent. as the result of hemorrhage. The cardiac weaknesses and kidney insufficiencies, as the result of anemia, will explain a certain number of deaths in operated and non-operated cases.

Thrombosis, Embolism, and Phlebitis.—Fibroid tumors of the uterus cause thrombosis, embolism, and phlebitis more often than any other pelvic lesion, the pelvic veins and veins of the legs being most often involved. Embolism of the lungs following thrombosis of these veins is one source of sudden death following operation for removal of a fibroid.

The contributing factors leading to thrombosis, phlebitis, and embolism are anemia, slowing of the circulation, injury to the veins, and infection.

Treatment of Uterine Fibroids.—The improved technic of myomectomy and of hysterectomy, together with a better understanding of the dangers of fibroids, has resulted in a revolution of the treatment of fibroid tumors of the uterus. Expectant treatment is no longer countenanced by some gynecologists.

Russell, Lewis, Bovée, Goffe, Eastman, Richardson, and others plead for early surgical intervention.

Charles P. Noble gives a critical analysis of 2274 cases of uterine fibroids. Two-thirds of this number were complicated. Noble estimates a prospective mortality of 30 per cent. in fibroid tumors of the uterus pursuing their natural course as compared with an operative mortality of 2.26 per cent. The high mortality in the expectant plan of treatment is ascribed to degenerations and complications in the tumor and uterus and to complications outside the uterus and tumors.

Advantages of Early Operation.—1. Lessens the hazards to life from malignant degeneration of the tumor and uterus.

2. Minimizes the chances of the development of degenerative changes in the tumor which imperil life, also of thrombosis and embolism.

3. Avoids prolonged ill health.

4. Lessens the operative mortality.

5. Preserves the function of childbearing.

Sippel supports the statement of Noble that operation is less dangerous than palliation by comparing the results of 47 operated cases in which there were no deaths, with 27 unoperated cases in which there were 6 deaths: 2 from hemorrhage, 3 from pulmonary embolism, and 1 from bronchitis.

The menopause does not provide immunity from the evil effects of fibroids; on the contrary, the dangers increase with age.

Winter bases his decision as to the indication for operation upon the symptomatology, and does not operate in the absence of symptoms caused by the fibroid or by complicating lesions. He believes that all the degenerations and complications which may prove dangerous will give rise to symptoms.

The author is in accord with the views of Winter, believing that the rule should be to operate only when symptoms arise. This implies that all fibroids, however small and wherever located, should be kept under observation, and that they should be operated upon as soon as symptoms arise.

Palliative Treatment.—Fibroids, with or without complicating lesions, often give rise to symptoms requiring relief. A radical operation is indicated in all such cases unless serious complications exist which would make operation hazardous or impossible. In this event palliative measures are the only alternative.

Relief from Hemorrhage.—A thorough curettage with prolonged rest in bed will most surely control the hemorrhages. However depressed

the patient may be as the result of anemia, it is usually possible to give the necessary anesthesia for the purpose.

The galvanic current was formerly used to control uterine hemorrhages, but it is now largely discarded.

Drugs are of slight value in controlling hemorrhage. Ergotin in 1- or 2-grain doses, given four times a day, will sometimes afford relief.

Relief from Pressure.—When a myomatous uterus is displaced backward, the pressure symptoms may be relieved by the insertion of tampons behind the cervix or by the wearing of a Hodge-Smith pessary. When the tumor is incarcerated in the small pelvis, and not adherent, it may be elevated by careful manipulations. This may require an anesthetic. No great amount of force should be used in these manipulations for fear of hemorrhages from broken adhesions or pedicle.

X-rays.—The *x*-rays promise to supplant surgery in many cases of uterine fibroids. By a series of applications of the rays to the ovaries, hemorrhages have been controlled and the tumor in time reduced in size. This action is due to the atrophic changes produced in the ovaries, thereby bringing on an early menopause. To just what extent the *x*-rays will prove effective in these cases is not yet known, but the method is deserving of extended trial. (See page 225.)

Contra-indications to Operation.—While there is no complication precluding surgical interference that does not apply to operations upon uterine fibroids, there are two conditions in particular which, because of their frequency and gravity, deserve special mention, *i. e.*, anemia and incompetent heart action. When these conditions exist to a marked degree, a course of preliminary treatment should precede the operation.

For the anemia, rest in bed, forced feeding, massage, and blood tonics are prescribed until the quality of the blood is built up to a degree that will admit of operation. When bleeding continues, a preliminary curettage should be done, and, if necessary, the vagina should be tightly packed with gauze.

An incompetent heart demands rest until it may be safely depended upon to withstand the stress of the operation. The patient is confined to bed, the bowels regulated with mild laxatives and enemata, the diet is light and nutritious, and such cardiac stimulants given as will regulate the force and rhythm of the heart action. The blood pressure is a good indication of the heart force, and should be taken at frequent intervals.

Uncomplicated fibroids in extreme age would justify non-interference when the same sort of tumor in the uterus of a younger woman would clearly suggest operative interference.

Preparatory Treatment.—Because of the frequency with which heart lesions and anemia complicate fibroids of the uterus, the preparation of the patient for operation may require days and possibly weeks.

In one instance the author was unable to control the loss of blood from a large submucous fibroid by the usual means of curettage, uterine tamponades, and rest in bed, and was obliged to perform a supravaginal hysteromyomectomy in the presence of a blood-count far below the standard of safety. The results were gratifying. Such

experiences are exceptional, though it has been the author's experience that fibroid cases which have reached a high degree of anemia, as a rule, bear the operation well. On the other hand, there is uncertainty as to the behavior of the heart during and after the operation. Acute dilatation may take place several weeks after operation, and with fatal results. Great caution must be exercised in respect to the heart in all cases of uterine fibroids, and particularly in those which have suffered for some time from loss of blood. The absence of heart murmurs and of increase in the area of heart dulness does not fully justify confidence in the integrity of the heart when put to the strain of an operation.

The preliminary preparation of the bowels and of the field of operation does not differ from that of other vaginal and abdominal operations. (See Chapters XIII and XIV.)

Choice of Operation.—Whether the tumor shall be removed, leaving the uterus, or the uterus be removed together with the tumor, is a question of great importance.

The number and relation of the tumors to the uterine wall, as well as the existence of complicating lesions, such as carcinoma of the uterus, pus-tubes, and extensive pelvic adhesions, may preclude all possibility of choice between hysterectomy and myomectomy. Excluding all cases over forty years of age, and all those in which there was no probability of childbearing because of social conditions, Winter found the following: 18 myomectomies for submucous fibroids, 4 conceptions (22 per cent.), 37 pregnancies following myomectomy, 26 (72.97 per cent.) went to term. 46 labors following myomectomy, with 6 abnormal labors, one of which was attributed to the operation.

When, however, the statistics of various operators are consulted and it is learned that not more than one woman in ten on whom a myomectomy is performed ever bears a child subsequently, we may conclude that the question of childbearing should not be considered with hysteromyomectomy. However, with the facts clearly stated to the patient, her wishes should be considered in choosing between the two operations when the conditions are favorable to either.

Against myomectomy is the possibility of leaving one or more small fibroids which may grow and cause trouble in later years. The majority of fibroids are multiple, and it is not possible to determine with certainty that small intramural fibroids do not exist. The percentage of recurrences is estimated at 8 per cent.

Unquestionably a larger percentage of cases are relieved of their symptoms through hysteromyomectomy than through myomectomy. According to Winter, 73 per cent. are relieved of their symptoms by myomectomy as compared with 97.3 through hysteromyomectomy. We are confronted with the question of the artificial menopause, with its trend of distressing manifestations, such as flashes of heat and cold, sweating, despondency, and numbness. These phenomena, of course, must result from the removal of the uterus and ovaries, together with the tumors. That these symptoms are exaggerated over those of the

natural menopause is a question upon which authorities do not fully agree. In my experience I have only observed such cases in which the removed ovaries were almost wholly degenerated, and in such cases the menopausal symptoms are not so pronounced as when the ovaries were normal. However this may be, it is certain that the question of precipitating the menopause should not enter largely into the choice between myomectomy and hysteromyomectomy in view of the greater mortality of the former. In submucous and subperitoneal pedunculated fibroids, in patients yet in the childbearing period, the choice may be made in favor of myomectomy in view of at least preserving the hope for childbearing, even though the chances are small. Finally, the choice of operation must hinge upon the question of the dangers involved This is, after all, the vital question.

In the hands of Winter, abdominal myomectomy gave a mortality of 9.8 per cent., while in supravaginal hysteromyomectomy the mortality was but 4.8 per cent. Kelly reported 306 myomectomies, with a mortality of 4.5 per cent., and 691 hysteromyomectomies, with a mortality of 3.1 per cent.

Rules Governing the Choice of Operation.—The following rules governing the choice of the several operative procedures may be safely adopted:

1. Subserous and submucous pedunculated fibroids should be removed by myomectomy.

2. Necrotic submucous pedunculated fibroids should be removed by vaginal myomectomy.

3. Necrotic submucous pedunculated fibroids should be first removed by myomectomy, and if other fibroids exist in the body of the uterus these should be removed, together with the uterus, at a later date.

4. Fibroids complicated by malignancy of the fibroid or uterus demand panhysterectomy.

5. The choice between supravaginal amputation of the uterus and panhysterectomy may be determined as follows:

(*a*) If the cervix is diseased, perform a panhysterectomy.

(*b*) If malignancy exists in the cervix, corpus, or tumor, panhysterectomy should be performed.

(*c*) If drainage is desired, the removal of the cervix will be advisable, though not essential.

(*d*) In all other cases supravaginal amputation will, as a rule, give better immediate and remote results.

The rare occurrence of cancer in the stump of the cervix is no argument against supravaginal amputation, in view of the greater safety of the operation.

Relative Frequency of Operations.—The following are the statistics compiled by Charles P. Noble from his case records:

Abdominal supravaginal hysterectomies	235
Abdominal panhysterectomies	14
Abdominal myomectomies	22
Removal of ovaries, etc.	15
Vaginal hysterectomies	7
Vaginal myomectomies	44
Total	337

Kelly favors myomectomy to a greater degree than does Noble. In 997 operations for fibroids, 306 were myomectomies and 691 hysteromyomectomies.

A Plea for the Preservation of the Ovaries in Operating for Fibroids of the Uterus.—*Should the ovaries be removed together with a myomatous uterus?*

The consensus of opinion is in favor of conserving the ovaries, or as much of them as is possible. We have the statement of Zweifel that the artificially induced menopause causes more suffering than does the natural one. He therefore endeavors to leave one or both ovaries. Olshausen, Werth, Rosthorn, and, in fact, most of the authorities assume a like position.

The author is in full accord with these views because experience has proved that the disturbances incident to the induced climacterium are greatly minimized by allowing one or both ovaries to remain. The ovaries should be dealt with according to their own merits. Every portion of healthy ovarian tissue should be conserved. Bland Sutton has rightly said, "The ovaries are of more importance to a woman than the uterus."

The author would go one step farther and advise the removal of only what is necessary of the uterus. When the fibroid is located upon the fundus it may be possible to remove the tumor and fundus and still preserve much of the uterus. This the author did recently, and to the satisfaction of the patient, who continues to menstruate. Unfortunately the tumors are seldom so favorably situated.

Operations for Uterine Fibroids.—Vaginal Myomectomy.—All operators agree that a pedunculated submucous fibroid, uncomplicated by fibroid tumors located elsewhere or by other pelvic lesions demanding relief, should be removed per vaginam and without sacrificing the uterus.

The scope of vaginal myomectomy has been extended by various operators to the removal of interstitial and subperitoneal fibroids of a size not to exceed that of the head of a fetus at term, but there are serious objections to such a procedure. In the first place the operation may prove difficult. Again, there is the uncertainty of the possible presence of other fibroids lying within the wall of the uterus, and of the existence of other pelvic lesions which would be recognized in an abdominal operation.

The author does not look with favor upon vaginal myomectomy for fibroids other than when pedunculated and submucous. This opinion has no more than a general application, because unquestionably there are cases in which the scope of the operation may be extended to interstitial and subperitoneal fibroids. For this reason the technic of the operation will be presented in its widest scope.

Indications for Vaginal Myomectomy.—1. Pedunculated submucous fibroids of whatever size.

2. Single sessile submucous fibroids of a size not to exceed 12 cm. in diameter. The operation should be preferred to supravaginal hystero-

myomectomy only when it is desired that the capacity for childbearing be safeguarded.

3. Single intramural fibroids of small size may be removed through an anterior or posterior colpotomy.

4. Small and moderate-sized subperitoneal fibroids may be removed either by anterior or posterior vaginal celiotomy. The author's preference is for abdominal myomectomy in such cases.

5. Small and moderate-sized fibroids of the cervix.

6. Infected submucous fibroids.

Contra-indications for Vaginal Myomectomy.—The limitations of vaginal myomectomy are largely determined by the size, number, and position of the tumor. In the practice of the author, vaginal myomectomy is only adapted to the removal of infected submucous fibroids, and of cervical fibroids of whatever size, and of uninfected submucous fibroids of small and moderate size. In all other instances he prefers the abdominal route. That there are greater possibilities for the operation is admitted (for indications *vide supra*), but in the author's opinion they are ill advised.

It may be laid down, as a general rule, that pelvic complications, of whatever nature, so long as they require operative interference, should determine the choice of approach in favor of the abdominal route, or a combination of the vaginal and abdominal routes.

Technic of Vaginal Myomectomy.—For pedunculated fibroids protruding from the cervix or attached to the vaginal portion of the cervix no anesthetic is required. For all other cases a general anesthetic is desirable. The usual preparation for vaginal operations is made. (See page 246.)

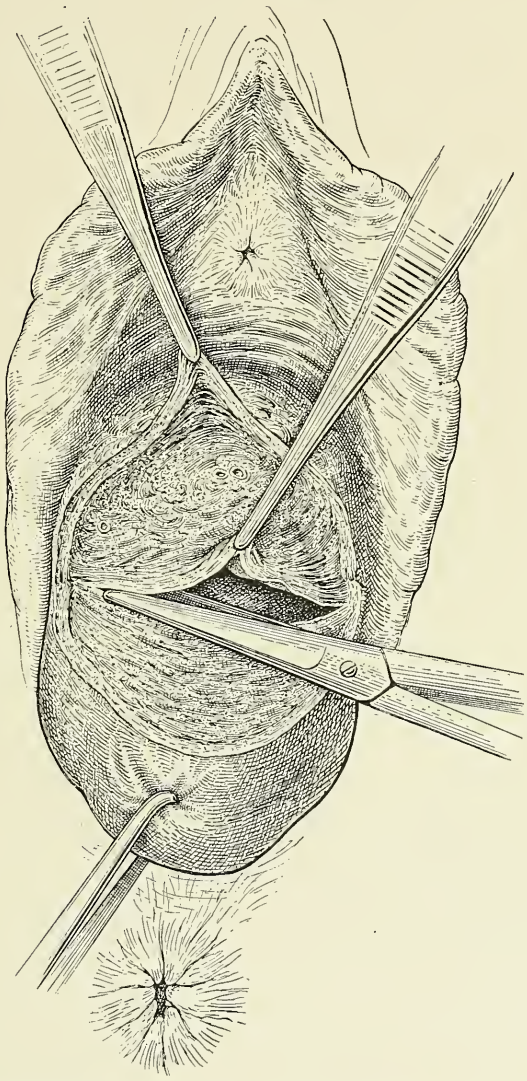
Pedunculated Submucous Fibroids.—When the cervix is dilated and the tumor presents in the vagina, the growth is grasped by a heavy vulsellum forceps and is twisted from its attachment. If, by traction upon the tumor, the pedicle can be reached with sharp-pointed scissors, it may be severed without fear of serious loss of blood. When there is partial inversion of the fundus, associated with the fibroid, care must be exercised in excising the tumor for fear of injuring the inverted wall of the uterus.

If the cervix is not dilated or the tumor is large and wedged in the cavity of the cervix, or the body of the uterus, it will be necessary to perform hysterotomy. This is done by bisecting the cervix laterally or anteroposteriorly.

Sessile Submucous Growths.—For the removal of sessile submucous growths, hysterotomy should be performed. The tumor is grasped by heavy vulsellum forceps, the capsule is incised about the base of the tumor, when with firm traction the tumor can, as a rule, be delivered. If the tumor is too large for delivery it may be divided into two or more pieces. All remaining fragments of the capsule are to be trimmed off with scissors, leaving as smooth a surface as possible. The cavity of the uterus should not be curetted or irrigated for fear of puncturing the uterus and washing the fluid into the abdominal cavity. After the

removal of the tumor the cavity should be packed with iodoform gauze for twenty-four to forty-eight hours, to control any possible

Fig. 399

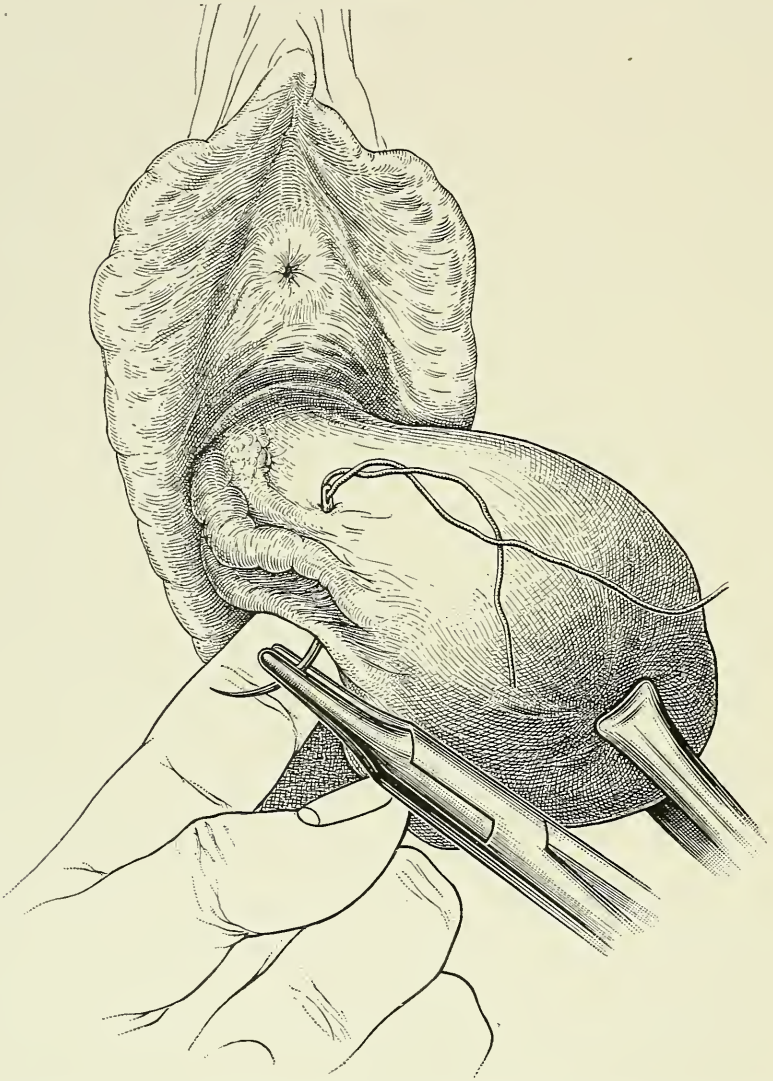


Vaginal hysteromyomectomy for an interstitial fibroid of the body of the uterus. Incision through the anterior vaginal wall one-half inch above the external os. Peritoneal cavity opened in front of the cervix. Step 1. (After Doederlein and Kroenig.)

hemorrhage and to serve as a protection against possible infection. Thereafter daily vaginal douches of formalin, 1 to 4000, are given.

Hysterotomy Followed by Vaginal Myomectomy.—When found impossible to deliver a submucous fibroid through the cervix, the uterus must be incised. The rule is to so incise the cervix as to

FIG. 400

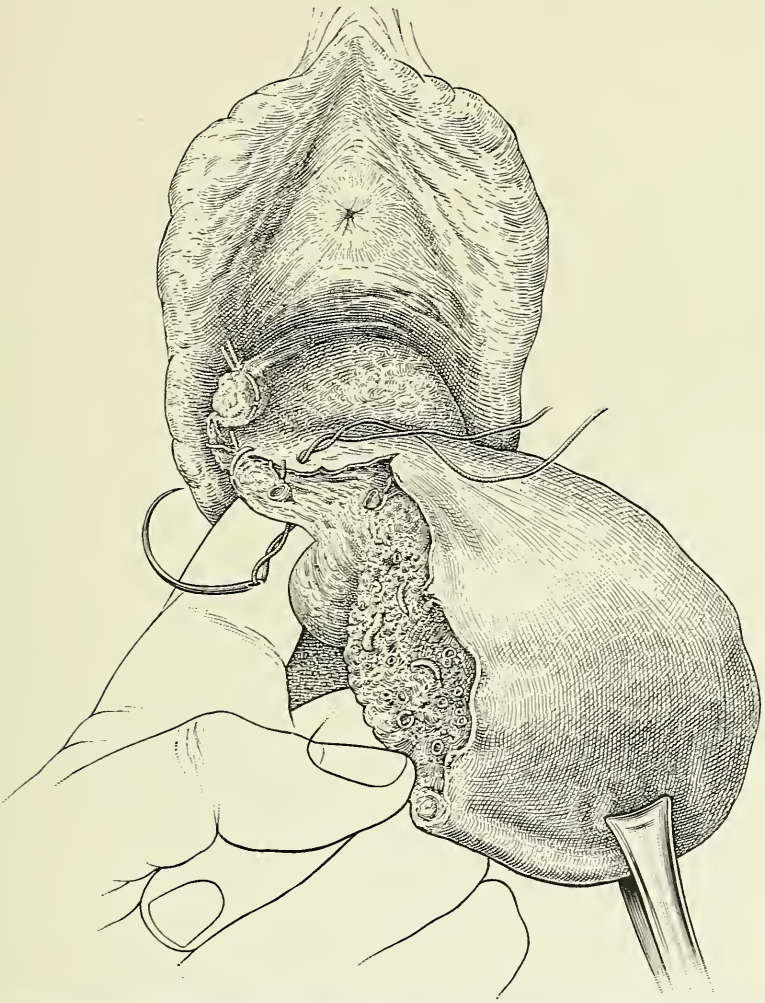


Vaginal hysterectomy for an interstitial fibroid of the body of the uterus. Fundus of the uterus brought forward through the anterior incision. Ligatures placed about the appendages and broad ligaments, passing from above downward. Step 2.

best expose the attachment of the tumor. The line of choice is the anterior median, but the posterior median or bilateral incisions are often chosen.

The author's preference is for either an anterior or posterior incision, or a combination of the two, for the reason that there is less likelihood of hemorrhage. More than this, when it is necessary to extend the incision beyond the limits of the vaginal portion of the cervix, the

Fig. 401

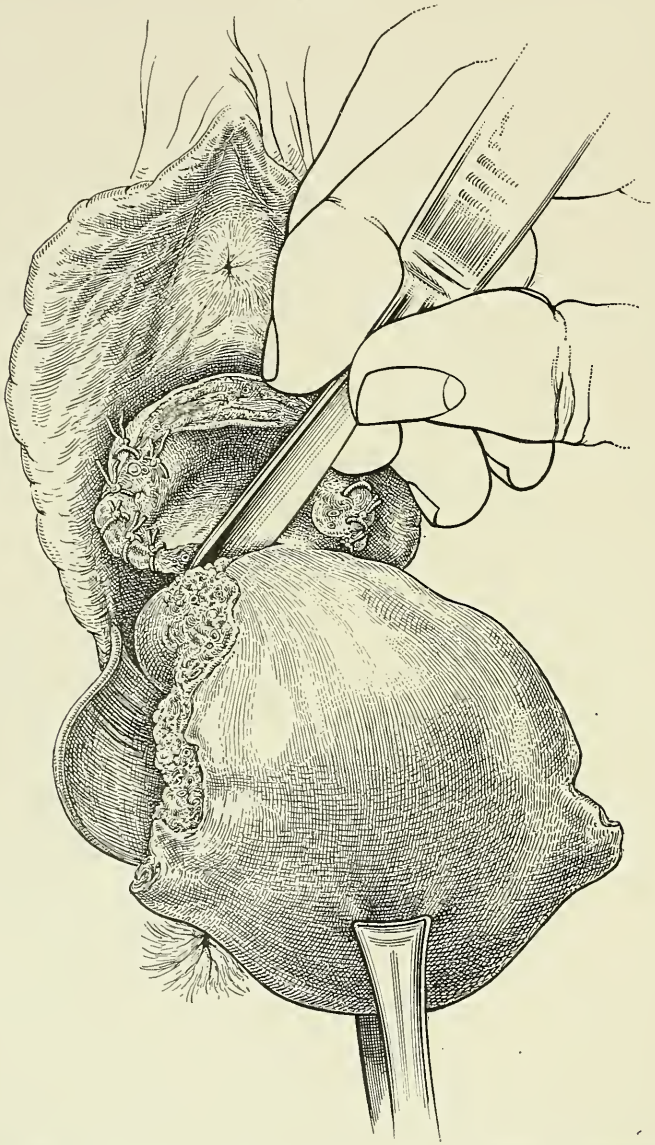


Vaginal hysterectomy for an interstitial fibroid of the body of the uterus. Final ligature placed about the base of the broad ligament. Step 3.

median incision can be lengthened to any desired extent by extending the incision through the supravaginal portion of the cervix in front or behind, or both. This incision may or may not involve the peritoneal cavity. When firm traction is made upon the cervix, but slight bleeding

is occasioned by the incision. After the removal of the tumor the incisions are closed by continuous chromicized catgut sutures.

Fig. 402

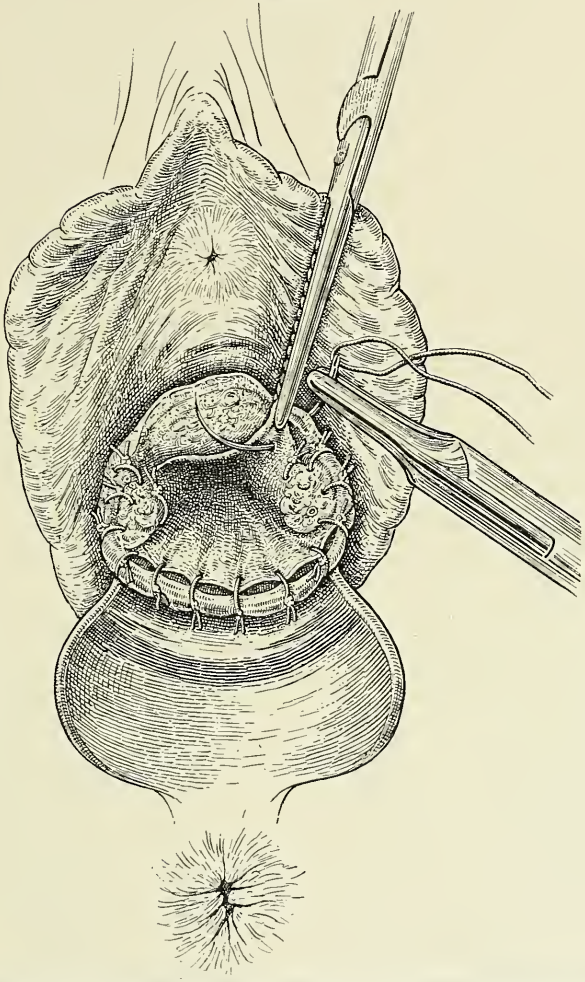


Vaginal hysterectomy for an interstitial fibroid of the body of the uterus. Uterus severed from its attachment to the posterior vaginal wall. Step 4.

Vaginal Celiotomy.—For the removal of intramural and subperitoneal fibroids through the vagina an anterior vaginal celiotomy is performed.

The uterus is drawn down into the vagina by means of a vulsellum forceps and the tumor removed in accordance with the principles laid down above. In all such cases the author's preference is for abdominal myomectomy or hysteromyomectomy.

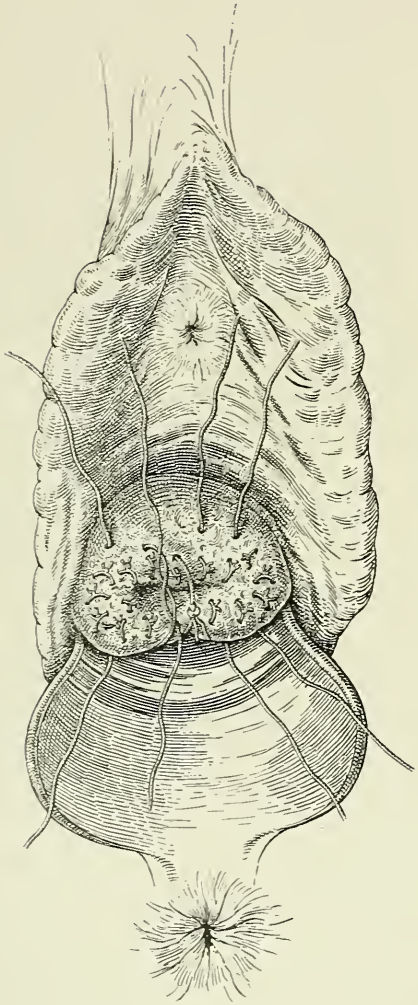
Fig. 403



Vaginal hysterectomy for an interstitial fibroid of the body of the uterus. Stumps of ligaments and tubes anchored to the vault of the vagina. Peritoneum stitched to the vaginal walls. Step 5.

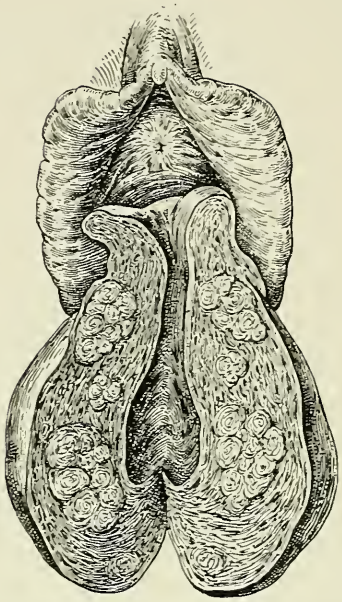
Noble recommends suturing the vesical fold of peritoneum above the closed wound in the uterus, when the tumor has been removed from the anterior surface, in order to lessen the dangers of hemorrhage and septic peritonitis. If the tumor is removed from the posterior surface of the uterus, a gauze drain is placed in the cul-de-sac for like reasons. The vagina should be lightly tamponed with iodoform gauze.

Fig. 404



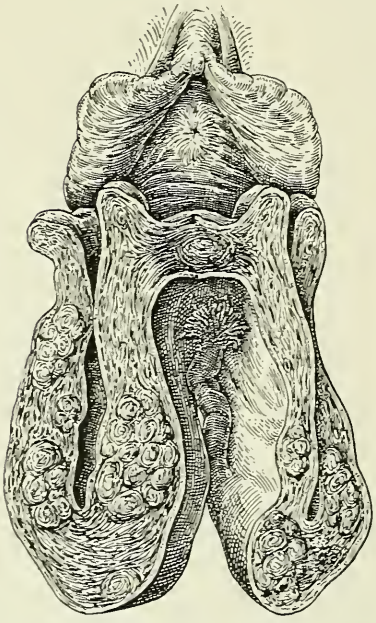
Vaginal hysterectomy for an interstitial fibroid of the body of the uterus. Closure of the vaginal walls with interrupted catgut sutures. Step 6.

Fig. 405



Splitting of the uterus in vaginal hysterectomy. Step 1.

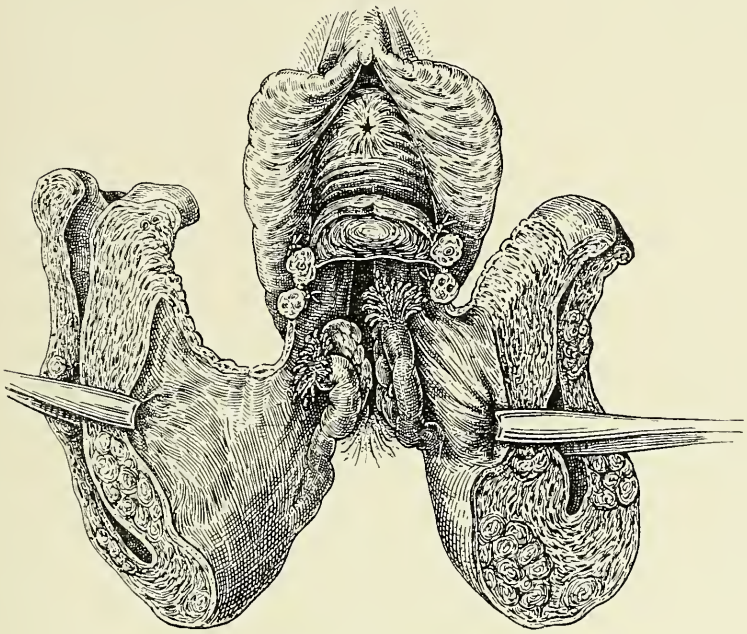
Fig. 406



Splitting of the uterus in vaginal hysterectomy. Step 2. (After Doederlein and Kroenig.)

When the uterus is large it will be found easier to split the uterus before attempting to remove it. (See Figs. 405, 406, and 407.)

Fig. 407



Splitting of the uterus in vaginal hysterectomy. Step 3.

Abdominal Myomectomy.—Before proceeding with an abdominal myomectomy the uterus should be curetted and irrigated with sterile normal salt solution. This is advised in view of the possible opening into the uterine cavity in the enucleation of the tumor, and of the possibility of substituting a supravaginal hysteromyomectomy for myomectomy.

Indications.—Pedunculated Subperitoneal Fibroids.—A wedge-shaped incision at the attachment of the pedicle to the uterus and the closure of the wound with No. 2 plain catgut sutures will complete the operation. No raw surfaces are to be left to invite the formation of adhesions.

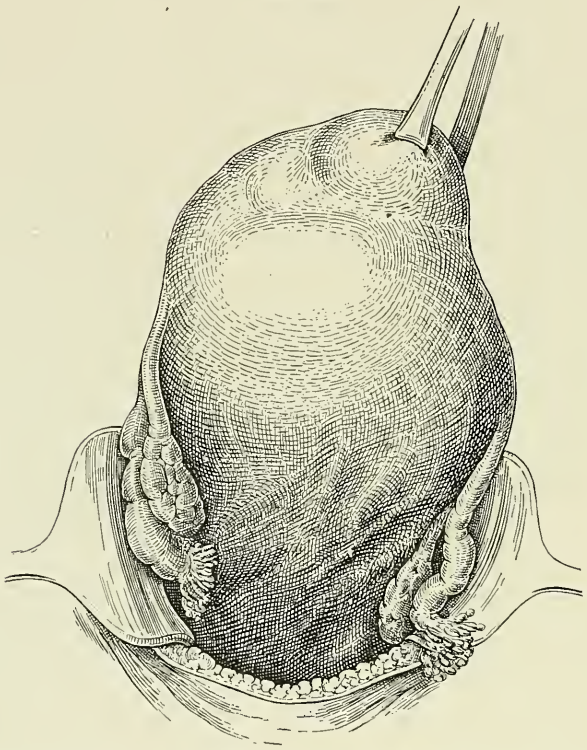
Sessile Subperitoneal and Intramural Fibroids.—Every possible precaution must be taken to guard against infection of the wound made in the uterus. Rubber gloves should be worn, and after delivering the uterus and tumors through the abdominal incision, a sterile towel should be packed about the edges of the wound to protect the field of operation from the skin surface of the abdomen incision.

A straight incision is made over the convexity of the tumor. The extent of the incision is measured by the diameter of the tumor. The muscularis is reflected from the tumor, the tumor is grasped by a vulsellem forceps, and while firm traction is made upon the tumor,

the enucleation is proceeded with by means of the handle of a knife, the blunt blades of scissors, or an enucleator especially designed for this purpose.

To facilitate the removal of large and deep-seated tumors it may be found advisable to bisect the tumor and enucleate either half separately.

FIG. 408

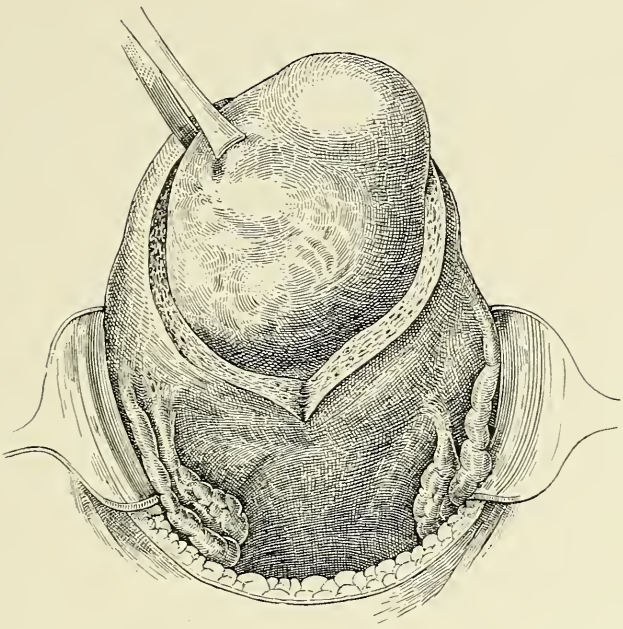


Myomectomy. Removal of an interstitial fibroid from the fundus of the uterus. Fundus grasped by a tenaculum forceps and delivered through the abdominal incision. Step 1. (After Doederlein and Kroenig.)

In small and superficial growths there is little loss of blood, but in large and deep-seated growths it is necessary to control the blood supply to the uterus by having an assistant firmly grasp the broad ligaments and supravaginal portion of the cervix with the hand. All spurting vessels should be ligated with fine, plain catgut, taking care to avoid crushing the tissues with forceps or unnecessarily strangulating tissues in the ligature.

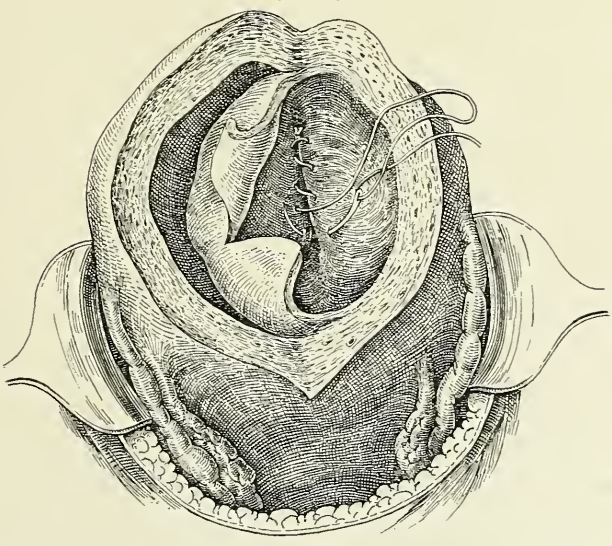
The cavity occupied by the tumor is obliterated by interrupted sutures of catgut placed in tiers. Care must be taken that no dead spaces are left in which blood may accumulate and that the sutures are not tied too tightly. A smooth serous surface should be left at the line of suture, otherwise adhesions may form. A mattress suture is best adapted for the serous surface.

FIG. 409



Incision made over the tumor, including the uterine wall and capsule of the tumor. Tumor grasped by a tenaculum forceps. Step 2.

FIG. 410



Obliteration of the cavity in the uterine wall by a continuous suture of plain catgut. Care exercised not to leave dead spaces or to constrict the tissues too tightly in ligating. Step 3.

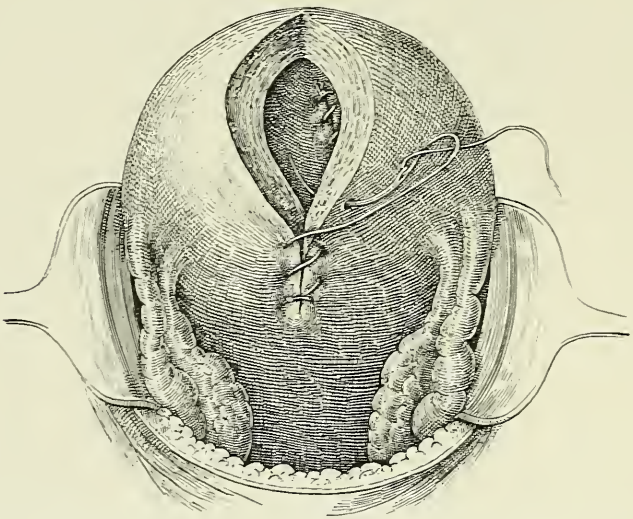
For the average operator a supravaginal hysteromyomectomy will yield better results than the removal of multiple tumors from the uterine wall.

Myomectomy in deep-seated fibroids is not an operation of choice for the average operator.

Abdominal myomectomy should never be performed in the presence of a pelvic infection or for the removal of degenerated fibroids.

Abdominal Myomectomy for Submucous Fibroids.—When the cervix is firmly contracted and the tumor is too large to deliver per vaginam, abdominal myomectomy may be considered, in view of possibly preserving the function of childbearing. The abdominal route should not be considered when it is possible to remove the tumor by morcellation. Again, the abdominal route should not be undertaken in the presence of a pelvic infection resident within or without the uterus, nor should a degenerated fibroid be removed through an abdominal incision.

Fig. 411



Closure of the uterine musculature and peritoneum with a continuous suture of plain catgut. Step 4.

As a preliminary measure the uterus should be curetted and irrigated with sterile normal salt solution. The technic of the operation does not differ from that of abdominal myomectomy in general. A median incision in the anterior wall, extending from the fundus to the cervix, is preferred.

Hysteromyomectomy.—1. Vaginal Hysteromyomectomy.—In the judgment of the author there are few indications for vaginal hysteromyomectomy. To successfully perform the operation without encountering unusual difficulties, the tumor and uterus should be no larger than a fetal head at term, the structures to be removed should be freely

movable, and the vagina should provide sufficient room to admit of the delivery.

In the majority of cases, answering these requirements, myomectomy or abdominal hysteromyomectomy would be preferred. When the abdominal wall is thick and the vagina roomy a vaginal hysteromyomectomy may be preferred to an abdominal operation. Furthermore, in infected and sloughing fibroids demanding the sacrifice of the uterus, vaginal hysteromyomectomy should be the operation of choice. In the presence of a sloughing or impacted fibroid it is advisable to first remove the tumor and await the time when the field of operation is free of infection before proceeding with a vaginal hysterectomy.

The technic of vaginal hysteromyomectomy does not differ from that of vaginal hysterectomy in its essential details. (See page 681.)

2. Abdominal Hysteromyomectomy.—The choice between supravaginal and total hysterectomy should be made in favor of the former whenever it is possible to leave a healthy cervix. The reasons for so doing are that the operation presents fewer technical difficulties, requires less time, there is less danger of injuring the ureters and less likelihood of creating a cystitis from injury to the bladder. Furthermore, the vault of the vagina is left intact.

When drainage is required or the condition of the cervix justifies its removal, and when the tumor is so located as to render a supravaginal amputation impossible, total hysterectomy is the operation of choice.

I. *Supravaginal Hysteromyomectomy.—Technic.*—The following steps are taken in uncomplicated cases: The abdominal incision should be of such length as to permit of easy delivery of the tumor. Care should be taken to prevent cutting the bladder, which may be found much elevated.

The hand is passed over the entire circumference of the uterus and tumors to determine the size and position of the tumor or tumors, to locate the point of amputation, and to detect and break up existing adhesions.

Delivery of the Tumor and Uterus.—The tumor is delivered from the abdomen by means of the hands or vulsellum forceps. This may be found difficult and require the aid of an assistant. When incarcerated in the pelvis, an assistant may place two fingers in the vagina and forcibly push the tumor upward in the axis of the superior strait, thereby reinforcing the efforts of the operator, who is making traction upon the tumor from above.

Immediately following the delivery of the tumor large packs of sterile gauze should wall off the intestines. For this purpose the author uses one or two five-yard rolls of gauze.

Ligation and Severing of the Appendages, Vessels, and Ligaments on Either Side of the Uterus.—For ligatures the author is in the habit of using No. 2 plain sterile catgut passed on an Olshausen pedicle needle. In large fibroids the veins are often found greatly enlarged, hence the necessity of exercising care in securing all vessels. The

ovarian and uterine arteries should be secured by two separate ligatures, thus affording double security. One linen and one catgut ligature for these vessels will give added security.

When the tubes and ovaries are normal there is no good reason for removing them. The preservation of the ovaries will ward off the nervous phenomena of the artificial menopause, which is a matter of grave importance.

The first ligature is made to embrace the tube, ovarian ligament, and bloodvessels entering the horn of the uterus. A second ligature is passed immediately to the side of the first. These structures are then severed between the ligatures and the uterine horn. The bleeding from the uterus is controlled by an artery clamp, placed close to the side of the uterus. A ligature is tied about the round ligament at its proximal end and the ligament severed close to the uterus. A single ligature is next passed through the broad ligament close to the uterus, and will, as a rule, incorporate the tissues of the broad ligament to a point near the uterine artery. This portion of the broad ligament is severed close to the uterus and the bleeding from the uterus secured by an artery clamp.

The process is repeated on the opposite side. Next the peritoneum is stripped from the uterus, beginning in front at a point, preferably about an inch above the attachment of the bladder. This incision should only extend the thickness of the peritoneum. With a gauze sponge wrapped about the finger the peritoneum is stripped downward to a point below the proposed line of incision through the cervix.

With the bladder pushed downward and forward the ureters are not so liable to injury in ligating and severing the uterine arteries. These arteries are ligated close to the uterus. Two ligatures are passed about them and the incision is made close to the cervix. Any spurting vessel must be secured by a separate ligature.

A tenaculum forceps is placed in the cervix at a point below the proposed line of amputation, by which the assistant may later hold the stump of the amputated cervix under control. A wedge-shaped incision is made through the cervix from before backward and downward and from behind forward and downward. The body of the uterus and tumors are then freed and are passed to an assistant.

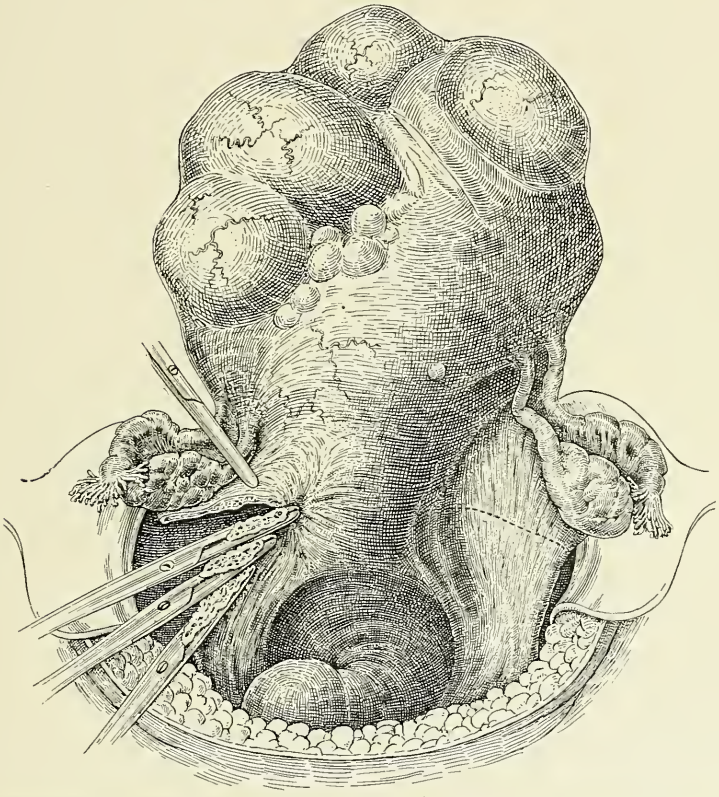
The next step is to disinfect the cervical canal, which may be done with a swab of carbolic acid or pure formalin, or with a Paquelin cautery.

The wedge in the cervical stump is then closed with a running suture of No. 2 plain catgut. The stumps of the tubes and ligaments are anchored to the lateral portions of the cervical stump. Linen or silk should be used for this purpose.

Finally, the peritoneum is closed over the cervix with a running suture of No. 1 plain catgut and in a manner that will leave a clean floor of peritoneum, free of raw surfaces, to which surrounding structures may not adhere. After carefully removing all blood from the pelvis the abdomen is closed without drainage.

Kelly's Modification of Supravaginal Hysterectomy.—The ligaments and appendages are severed on one side and the peritoneum and bladder are reflected from the anterior surface of the uterus as described above. After ligating the uterine artery, Kelly proceeds to amputate the cervix close to the vault of the vagina. As the amputation proceeds the assistant draws the uterus to the opposite side. As the last fibers of the cervix are severed, the uterine artery of the opposite side presents and is clamped by an assistant about an inch above the cervical stump. By rolling the uterine body still farther to the opposite side the round ligament comes into view; this is clamped at the level of the pelvic brim and severed. (See Fig. 418.)

Fig. 412



Supravaginal abdominal hysteromyomectomy. Posterior aspect. Broad ligaments clamped below the appendages. Step 1.

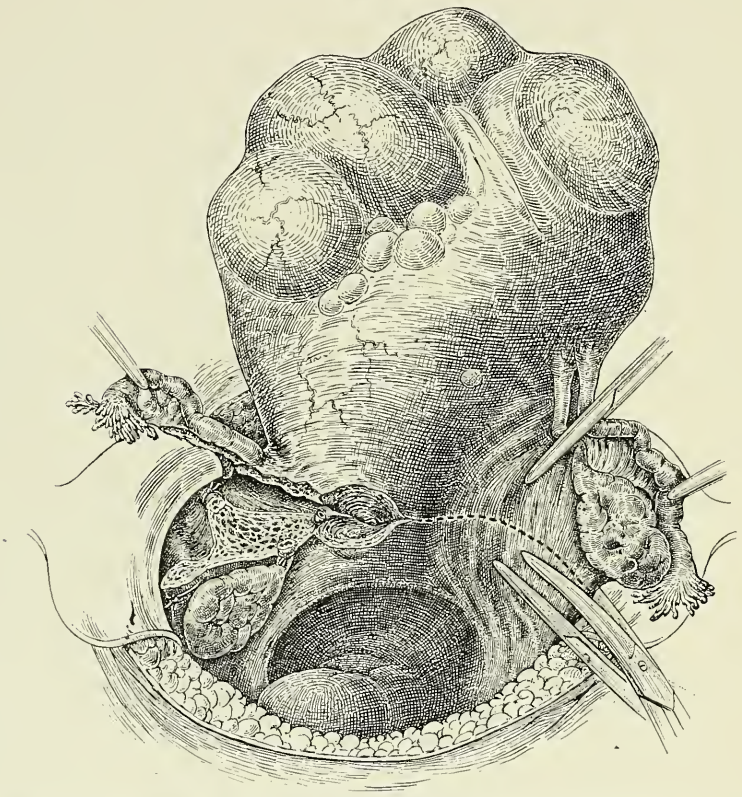
This removes the body of the uterus and tumors and the remaining steps of the operation are the same as described above. This operation is particularly adapted to the removal of a broad ligament fibroid.

When it is necessary to remove the appendages of the uterus, the only variation in the above technic consists in the ligation of the

infundibulopelvic ligament in place of the structures incorporated in the first ligatures as above described.

II. *Total Abdominal Hysteromyomectomy.*—The first steps of the operation are identical to those of supravaginal amputation. (*Vide supra.*) These steps are the ligation of the ovarian and uterine vessels, the separation of the appendages and ligaments close to the uterus and down to the supravaginal portion of the cervix and the turning down of the peritoneal cuff and bladder on the anterior surface of the uterus.

Fig. 413



Broad ligament cut between clamps and uterus. Ligatures placed about the uterine artery. Ovarian ligament, round ligament, and infundibulopelvic ligament. Step 2.

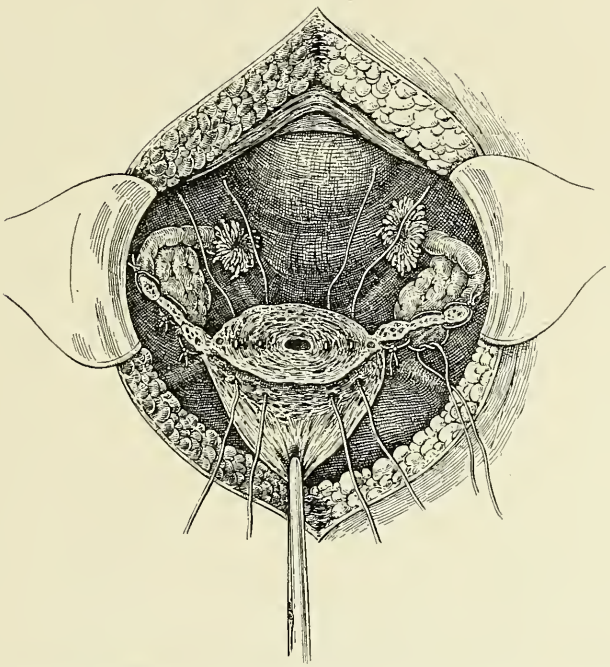
The bladder is stripped entirely from the cervix, exposing the vaginal wall as it is reflected upon the cervix. The uterus is then drawn upward and backward and a transverse slit is made into the anterior vault of the vagina, close to the cervix. This opening is made with sharp-pointed scissors and is about one inch in length. Before making this incision the vaginal wall is carefully identified with the finger and is recognized by palpating the vaginal portion of the cervix through

it. If gauze had been previously packed in the vagina it will be felt through the wall of the vagina before making the incision.

The incision is then extended around and is made close to the cervix to avoid injury to the surrounding structures, notably the ureters. This completely frees the uterus from its attachments when it is removed.

All bleeding points are temporarily secured with clamps. The peritoneum posterior to the bladder is stitched to the margin of the anterior vaginal flap; the broad ligaments, round ligaments, and tubes are anchored with linen to the outer angles of the vaginal opening and, finally, the vaginal walls and peritoneum are stitched together from before backward, thereby approximating the peritoneum in front with that attached to the posterior flap of vagina.

FIG. 414



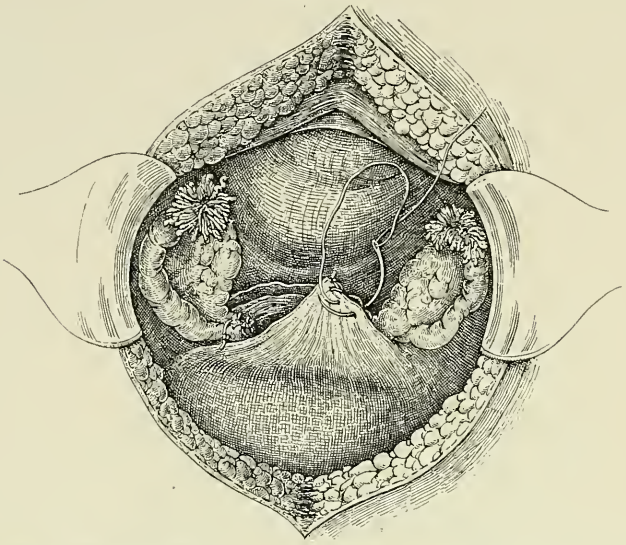
Peritoneum and bladder reflected from the supravaginal portion of the cervix. Body of the uterus amputated at the internal os. Interrupted sutures placed in cervical stump preparatory to closure of the stump. Step 3.

The completed operation leaves a smooth bed of peritoneum at the pelvic floor, with the ligaments so anchored that they prevent prolapse of the walls of the vagina.

If the appendages are removed the severed edges of the broad ligaments are approximated with a running suture of catgut. For all ligatures and sutures the author uses No. 2 plain sterile catgut, with the addition of linen sutures to secure the ovarian and uterine arteries and to anchor the ligaments to the vault of the vagina.

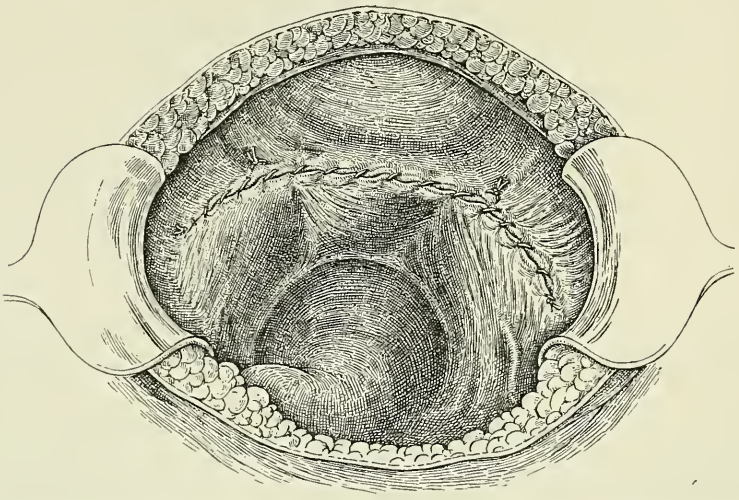
Conservation of Ovaries after Hysterectomy.—It is the experience of Dickinson that four-fifths of the patients from whom the uterus has

Fig. 415



Round ligaments, ovarian ligaments, and tubes anchored to the stump of the cervix and a fold of peritoneum sutured over the stump of the cervix. Step 4

Fig. 416



Completed operation with the appendages removed. The pelvic floor is completely covered with peritoneum.

been removed and the ovaries left *in situ* are free from the disturbances of the surgical menopause. He finds better results in this regard when

both ovaries are left than when one is removed or both are resected. When the disturbances do occur, their character is less severe and more gradual than after bilateral removal of the ovaries. Sexual vigor is maintained when both ovaries are conserved, but will be lost at an earlier time than in the normal woman.

Management of Complications in Hysteromyomectomy.—The complications of fibroids of the uterus are so frequent and varied as to present innumerable and oftentimes serious difficulties. It is not a difficult undertaking to perform an uncomplicated hysteromyomectomy, but the presence of complications may require formidable operative procedures that will tax the skill of the most expert operator.

The following classification of complications as enumerated by Kelly present a formidable array:

1. *Adhesions and Affections of Surrounding Structures.*—(*a*) *Inflammatory.*—Peritoneal adhesions frequently bind the tumor and the uterus and its appendages to the surrounding structures. These vary in extent and firmness. So far as possible they are to be severed by the fingers; thus the utmost caution must be exercised to prevent injury to adherent structures, notably the bowel, bladder, and important bloodvessels. When the appendages are inaccessible through overhanging tumor growths and the embedding of the tube and ovary in firm adhesions on the floor of the pelvis, it may be found advisable, as Kelly has pointed out, to at first ligate and sever the ovarian vessels at the outer extremity of the broad ligaments, and to tie and sever the round ligaments at their uterine attachment. This opens up the top of the broad ligament when the uterus can be lifted to the opposite side, thereby giving better access to the appendages. When the adhesions are far more extensive on one side, and particularly when accumulations of pus are to be dealt with, it is best to adopt the Kelly modification, by severing the attachments on the opposite side and removing the uterus, when the inflammatory mass, together with the abscess, may be removed with comparative ease.

Whenever pus is suspected great care should be exercised in walling off the abdominal cavity with sterile pads before disturbing the adhesions. When pus is encountered it must be aspirated or carefully swabbed out before proceeding with the further steps of the operation. A careful toilet of the peritoneum must be made with sponges, fresh sterile gauze packs should be placed about the field of operation, and the gloves of the operator and assistant changed. In such cases a complete hysterectomy is preferred to supravaginal amputation, for the reason that drainage can be more readily established through the vagina.

The omentum, containing large bloodvessels, may be adherent to the tumor and require resection before proceeding with the removal of the uterus. Adhesions between bowel and tumor most often involve the sigmoid, less frequently the rectum and cecum, and rarely the small bowel. These can usually be readily separated with the fingers, but when they are closely adherent it is safest to remove the tumor capsule, leaving it attached to the bowel.

An appendix adherent to the tumor requires careful manipulation. If the adhesions are light the separation presents no difficulties, but when they are dense it is best to remove the appendix, together with the adhesions. The Kelly modification of removing the uterus and tumors from left to right is applicable in these cases.

(*b*) *Tumors and other swellings of the ovary*, when large, should be removed before proceeding with the uterus. When of small size the entire mass should be removed together.

(*c*) *Cancer of the cervix and corpus* complicating uterine fibroids require panhysterectomy.

2. *Complications Due to Changes in the Tumors Themselves.*—All sorts of degenerative processes in myomatous tumors (see page 586) are dealt with on the general principle laid down for the classical operations of supravaginal and panhysterectomy.

FIG. 417

Fibroid in anterior wall of the uterus, elevating the bladder.

3. *Complications Due to the Location of the Tumors.*—Myomatous tumors may be so located as to present a formidable problem to the operator. They may be so located as to crowd the bladder, ureters, sigmoid, and uterus quite out of their normal relations, so that the usual landmarks are obscured.

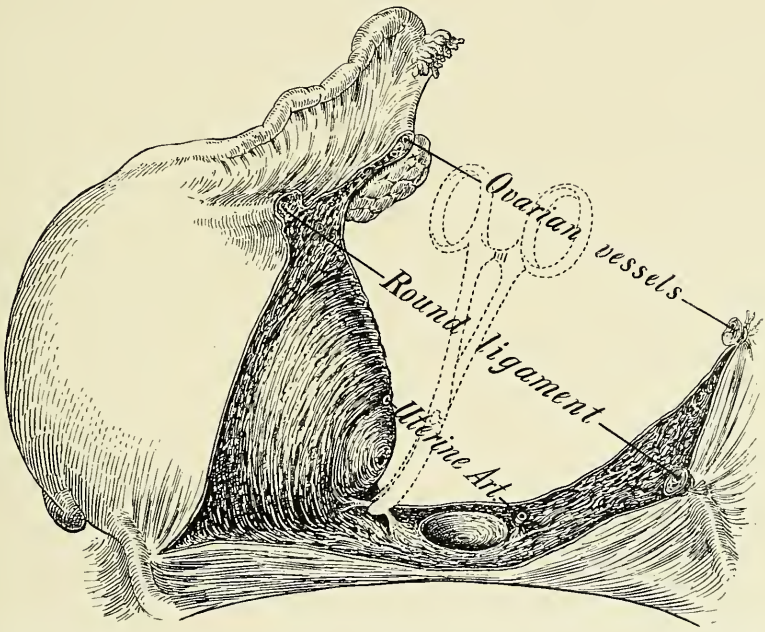
When the tumor is large and occupies the body of the uterus, making it difficult to recognize and to ligate the broad ligaments which are drawn in a vertical direction close to the brim of the pelvis, it is advised by Kelly to bisect the uterus and remove each half separately. When possible a long forceps or sound should be passed through the uterine canal to serve as a guide. Without this guide there is danger of carrying

the incision into the uterine vessels. Considerable bleeding may be encountered and require the free use of forceps until the uterine vessels can be secured.

Again, it may be possible to gain room and thereby facilitate the operation by first enucleating the fibroid, after which the uterus can be removed.

Large tumors lodged beneath the vesical peritoneum may expose the bladder to injury in opening the abdomen. To avoid this accident, the peritoneum should be opened at the upper limit of the incision and the incision enlarged downward. Kelly advises to first tie off the left ovarian bloodvessels, then to cut with scissors the peritoneum from round ligament to round ligament, this to be followed by deflection of the peritoneum and bladder when the uterine vessels are exposed and tied.

FIG. 418



Supravaginal hysteromyomectomy. Body of uterus amputated from left to right. (After Kelly.)

Broad Ligament Fibroids.—The great danger in the removal of broad ligament fibroids lies in the possible injury to the ureters. The displacement of the ureter by broad ligament fibroids of large size may be such as to mislead the most experienced operator.

In removing a large, broad ligament fibroid the sigmoid must be carefully freed, so as to expose the ovarian vessels; these are ligated and severed at the periphery of the tumor. The round ligament is ligated and severed near to the uterus, and the two points are connected by an incision made with scissors through the peritoneum over the circumference of the tumor. The peritoneum is then stripped from

the tumor, the tumor grasped with a heavy vulsellum forceps and dissected from its bed of cellular tissue. The uterine vessels are now exposed and ligated near the uterus, taking care to avoid injury to the uterus. The body of the uterus is then amputated at the internal os, and from this point the operation proceeds in the usual manner.

Combined Submucous and Corporeal Tumors.—When there has been bleeding, making complete extirpation of the uterus hazardous, it is advisable to first remove, per vaginam, the submucous growth and, at a later date, when the patient's strength is restored, to remove the uterus, together with the corporeal tumors. The same method should be adopted when the submucous growth is necrotic.

If the strength of the patient will permit, and degenerative changes are absent in the submucous growth, the entire tumor mass and uterus may be removed *en masse* through the abdomen.

Fibroids Complicating Pregnancy, Labor, and the Puerperium.—**Frequency of Fibroids Complicating Pregnancy.**—Pinard found 84 cases in 14,000 pregnancies. Klinik Baudelocque had 85 cases in 13,813 pregnancies. It is probable that a larger unrecognized percentage exists.

Influence of Pregnancy on Fibroids.—The rule is that fibroids grow rapidly during the period of pregnancy. The rate of growth is proportionate to the vascularity of the tumor and to the intimacy of the tumor to the uterus. Hence it follows that interstitial fibroids commonly take on a rapid growth while pedunculated subperitoneal fibroids usually grow slowly, if at all. The increase in size is largely due to edema of the tumor and, to a lesser degree, to true hypertrophy or other forms of degeneration of the tumor substance. Necrotic changes rarely develop in pregnancy, but are common in the puerperium. The form of necrosis is usually suppuration or gangrene. After such an event a submucous fibroid may be expelled from the uterus, and subperitoneal fibroids have been known to slough through the bladder, vagina, rectum, and abdominal wall.

Influence of Fibroids on Pregnancy.—Pregnancy, labor, and the puerperium may proceed without alteration in the presence of a uterine fibroid, but, on the other hand, serious complications may arise. The influence of a fibroid tumor upon the pregnant uterus is largely determined by the size and position of the growth.

1. *Fibroids of the Cervix.*—Fibroids of the cervix do not seriously embarrass the development of the pregnant uterus, but may interfere with the engagement of the presenting part and with the delivery of the fetus and placenta. The cervix may fail to dilate in the presence of a fibroid tumor of the cervix. These embarrassments may be relieved by the protrusion of the tumor through the cervix or the spontaneous disengagement of the tumor when it is submucous. Subserous tumors may become pedunculated and rise out of the pelvis, or they may soften from edema and so flatten out as to permit the passage of the child.

2. *Fibroids of the Body of the Uterus.*—Fibroids of the body of the uterus do not permit of the development and distention of the uterine

musculature at the seat of the tumor; this leads to a compensatory thickening in the surrounding musculature. As a consequence the uterine contractions are embarrassed, labor is prolonged, and postpartum hemorrhages are liable to occur. Large fibroids distort the uterine cavity and lead to malpositions and malpresentations of the fetus. Malformations of the fetus are the possible result of large submucous and interstitial fibroids. Great difficulty may be experienced in delivering the placenta when it is implanted above a protruding fibroid. In such an event sepsis and postpartum hemorrhages are the possible consequences. Wenkel estimates that placenta prævia occurs in 3.4 per cent. of all cases of fibroids complicating pregnancy, and adherent placentæ are of frequent occurrence. Interference with free drainage of the lochia may result from an obstructing fibroid.

Subserous tumors may be incarcerated or adherent in the pelvis in such a manner as to prevent the development of the pregnant uterus. In such an event pregnancy would have to be terminated. Hemorrhage, ileus, ischuria, uremia, hydronephrosis, pyonephrosis, and rupture of the uterus are occasional complications arising out of the presence of a fibroid in the body of the uterus. Fibroids often diminish in size, and in rare instances wholly disappear after the end of the puerperium. This fortunate outcome is not to be anticipated because of its unusual occurrence.

Treatment.—No definite rules can be formulated for the management of these cases because the uterus, fetus, and tumor present themselves under such varying conditions.

1. *No interference* is demanded in 70 to 80 per cent. of cases.

2. Subperitoneal fibroids, causing pressure symptoms, may sometimes be *elevated by bimanual manipulations* and the pregnancy proceed to term. When this cannot be done an abdominal section is preferred to the induction of abortion.

3. *The induction of abortion* is not looked upon with favor because of the great liability of hemorrhage and infection and the certainty of leaving a tumor which will subsequently demand operative interference. It is better to accomplish both at the same time.

4. *Myomectomy.*—Only pedunculated submucous and subperitoneal fibroids justify myomectomy. Even under the most favorable conditions there is great liability to miscarriage. Under no circumstances should a fibroid be shelled out of the wall of a pregnant uterus.

Myomectomy immediately followed by the induction of abortion is hazardous because of the dangers of rupture of the uterus, hemorrhage, and infection.

Cesarean Section.—When the child is at or near term and the fibroid tumors are of such size and location as to justify the sacrifice of part or all of the uterus, a classical Cesarean section should be performed and the uterus removed. Care must be taken to avoid cutting through the tumor in removing the fetus.

The Porro operation is preferred to Cesarean section when the uterus is believed to be infected. The location of the tumor will generally determine the choice between supravaginal and total hysterectomy.

CHAPTER XXVIII

CARCINOMA AND SARCOMA OF THE UTERUS

Carcinoma of the Uterus
- Topographical Classification
- Etiology
- Anatomical Diagnosis
- Clinical Diagnosis
- Microscopic Diagnosis
- Differential Diagnosis
- Diagnosis of Extension
- Treatment
- Operative Treatment
  - Simple Vaginal Hysterectomy
  - Byrne Method
  - Schuchardt Operation
  - Radical Abdominal Operation
- Treatment of Cancer of Cervix Complicating Pregnancy
- Treatment of Inoperable Cancer of Cervix
- Treatment of Cancer of Body of Uterus
- Endothelioma

Sarcoma of the Uterus
- Etiology
- Anatomical Diagnosis
- Microscopic Diagnosis
- Clinical Diagnosis
- Prognosis
- Treatment

CARCINOMA OF THE UTERUS

Topographical Classification.—Carcinoma may arise from any portion of the uterine mucosa, both within the uterus and covering the vaginal portion of the cervix. The classification proposed by Ruge and Veit is as follows:

1. **Carcinoma of the vaginal portion of the cervix,** including the vaginal surface of the cervix from the external os to the vault of the vagina.
2. **Carcinoma of the cervix,** including the mucosa of the cervical canal.
3. **Carcinoma of the body of the uterus,** including the mucosa from the internal os to the horns of the uterus.

It will be observed that the location of the newgrowth is not only of pathological interest but has much to do with the manner of diagnosis, the clinical manifestations, prognosis, and treatment.

Etiology.—The essential cause of carcinoma is as yet unknown. Certain predisposing causes are well recognized and require consideration.

Age.—We find carcinoma of the uterus *commonly appearing about the time of the menopause.* Carcinoma of the vaginal portion more often makes its appearance immediately preceding the menopause, and carcinoma of the body usually appears a few months or years later. The earliest recorded case appeared at eight years of age. The author observed a case of carcinoma of the vaginal portion in a woman, aged ninety-three years, forty-eight years after the menopause. The greatest number appear between forty and fifty years of age.

In 3385 cases of cancer of the uterus Gusserow found but two originating before twenty years of age.

Heredity.—Heredity, while playing an important role, is of less importance as an etiological factor than was formerly believed. In 142 cases of uterine carcinoma, Roger Williams found that heredity has some part in their development in 19.7 per cent.

Race.—It has been said that the negress is particularly exempt from carcinoma of the uterus. Later observations tend to disprove this view, indicating that she is little less susceptible than the white woman. Uterine carcinoma is believed to be more common in Europe than elsewhere, and is said to be rare in the tropics.

Childbearing.—Childbearing appears to have an important relation to the development of carcinoma of the vaginal portion. The author has seen but two carcinomata of the vaginal portion in nulliparæ whose cervices had never been dilated. The great rarity of carcinoma of the cervix in nulliparæ speaks for the influence of trauma as a factor in the development of cancer. Carcinoma of the body of the uterus is said to be more frequent in nulliparæ.

There can be no question that the *inflammatory lesions of the uterus* (endometritis and erosions) are not seldom the starting-points of carcinoma, but that scars in the cervix are such, is justly questioned.

Uterine Fibroids.—While *fibroids* and *carcinoma* are often associated in the uterus, it is not probable that the one is in any way dependent upon the other for its existence.

So frequently, however, is carcinoma found to develop in a myomatous uterus, that we are justified in regarding with suspicion of carcinoma a myomatous uterus that begins to bleed after the menopause.

Social State.—Carcinoma of the uterus is found more frequently in the lower orders of society. These classes are more susceptible to and neglectful of infections and traumatisms. On the other hand, the lesion is less frequently seen among the uncivilized classes.

Cohnheim's theory of cell inclusion is not supported by observations made upon the carcinomatous uterus.

Leopold concludes from a series of experiments that pure cultures of the blastomycetes may be found in fresh carcinoma of the ovary. He injected a pure culture into the testicle of a rat. The animal died, and on the peritoneum were found nodules in which were similar blastomycetic organisms. Leopold infers that this organism may be the cause of carcinoma in man.

Frequency.—The frequency of carcinoma of the uterus is variously stated. Welsh found that in 31,482 cases of carcinoma, 29.5 per cent. were of the uterus. In point of frequency the uterus takes second rank to the stomach as a primary seat of carcinoma. There can be no doubt but that carcinoma is on the increase, though it is only fair to admit that the perfected means of diagnosis account in large part for the statistics.

Roger Williams estimated that over 10,000 women suffered from uterine carcinoma in England and Wales in 1898. He further estimated

that of the deaths occurring in women over thirty-five years of age, one in thirty-five is due to carcinoma of the uterus.

Anatomical Diagnosis.—1. **Carcinoma of the Vaginal Portion of the Cervix.**—Carcinoma of the vaginal portion of the cervix may tend to grow superficially into the vagina, forming a polypoid or cauliflower growth, or it may deeply infiltrate the cervix.

(*a*) *Cauliflower Carcinoma.*—Cauliflower carcinoma of the vaginal portion of the cervix is seen as a sessile or pedunculated growth, arising from one or both lips of the cervix. It varies in size up to the complete filling of the vagina. The surface is generally covered with a slimy, gangrenous deposit. The whole mass bleeds readily to the touch and is friable. The surface is uneven, nodular, polypoid, or villous.

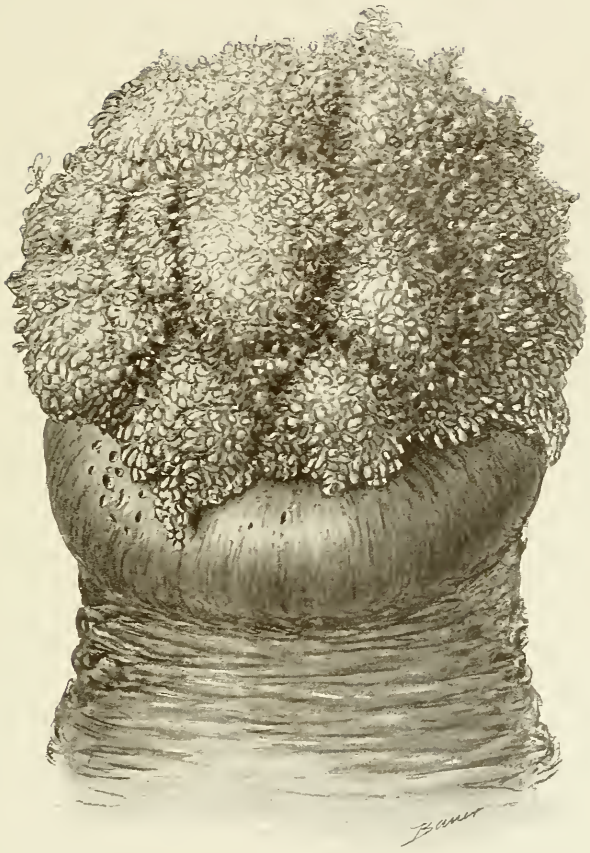
(*b*) *Infiltrating Carcinoma of the Vaginal Portion of the Cervix.*—Infiltrating carcinoma of the vaginal portion of the cervix appears in the early stage as an irregular thickening and hardening of the cervix. The anterior lip is most often first involved. Cullen distinguishes three stages according to the degree of infiltration and disintegration of the cervix. While this classification is purely arbitrary, it will be found convenient for purposes of description:

Stage 1. *The Stage of Infiltration in the Absence of Disintegration.* The surface is hard, friable, and uneven. The color of the surface is glistening, bluish white. Cross-sections of the growth show a gray or yellowish-gray surface, often cutting like cartilage. Fibrous striations are seen to course through the structure, isolating nests of friable homogeneous tissue, the so-called cancer nests. By squeezing the surface these nests may be emptied of their cell contents, leaving small, shallow depressions. Such nests are not to be confused with Nabothian follicles filled with inspissated mucus. The two may be found in the same section. Unfortunately, cancer of the vaginal portion is seldom observed at this stage, because of the mild symptoms which prevail. Not infrequently there is an entire absence of symptoms. While impossible to say without an anatomical dissection, it is probable that the growth is still confined to the cervix. Yet it must be borne in mind that not only regional but general dissemination of the carcinoma may occur at this stage.

Stage 2. *The Stage of Moderate Disintegration.*—The carcinomatous tissue has partly disintegrated, leaving a depression with irregular, hard, elevated margins. The base of the ulcer is uneven, and covered with a stinking slough of a grayish-yellow or gangrenous character. Upon handling, the affected tissue bleeds freely and is friable. In this stage the growth is rarely confined to the cervix. Ulceration of a cancerous growth does not usually begin until the disease has run about half its course. In a small proportion of cases the growth never ulcerates. (See Plate XXVIII.)

Stage 3. *The Stage of Complete Disintegration of the Vaginal Portion of the Cervix.*—In the vault of the vagina is a sloughing, stinking, ragged crater. No cervix is to be seen or felt. The vaginal walls are invaded and form the margins of the crater. The paravaginal connective tissue,

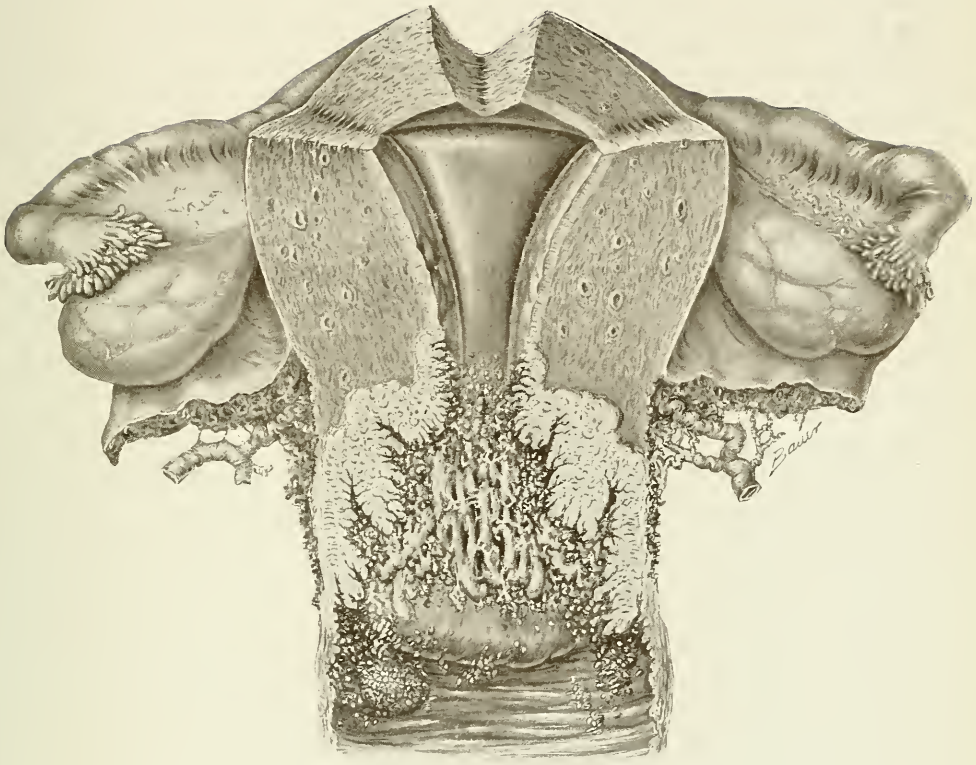
PLATE XXVII



Cauliflower Carcinoma of the Cervix.

An irregular papillary growth occupies both lips of the cervix. It is friable and bleeding. There is no perceptible infiltration of the cervix.

PLATE XXVIII

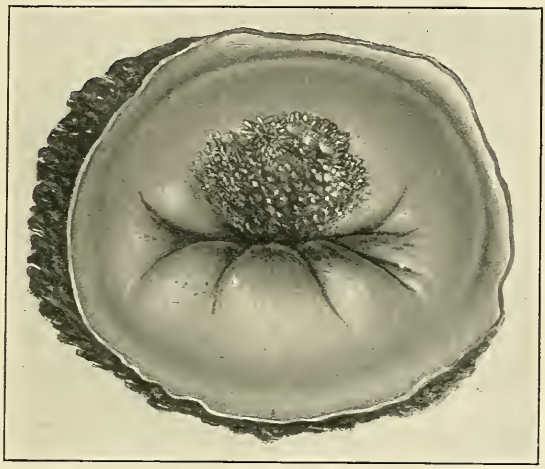


Carcinoma of the Cervix, with Partial Disintegration.

The growth is soft, friable, and bleeding. The vagina and body of the uterus are invaded.

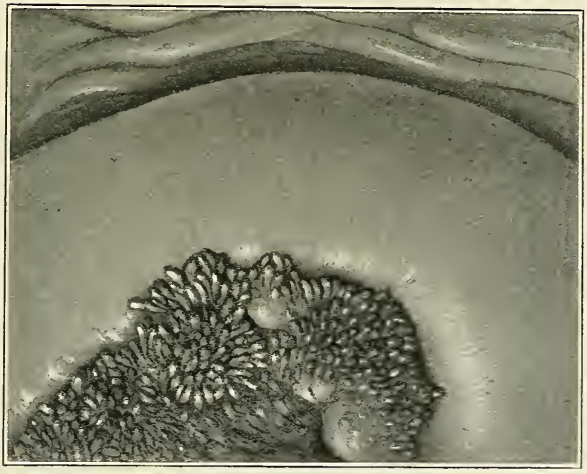
broad ligaments, and uterosacral ligaments are infiltrated. The growth is slow to pass beyond the internal os into the cavity of the uterus, but may extend to the fundus. Isolated cancerous nodules may lie in distant portions of the vaginal wall. Contact growths may develop

FIG. 419



Early carcinoma of the anterior cervical lip. (Martin.)

FIG. 420



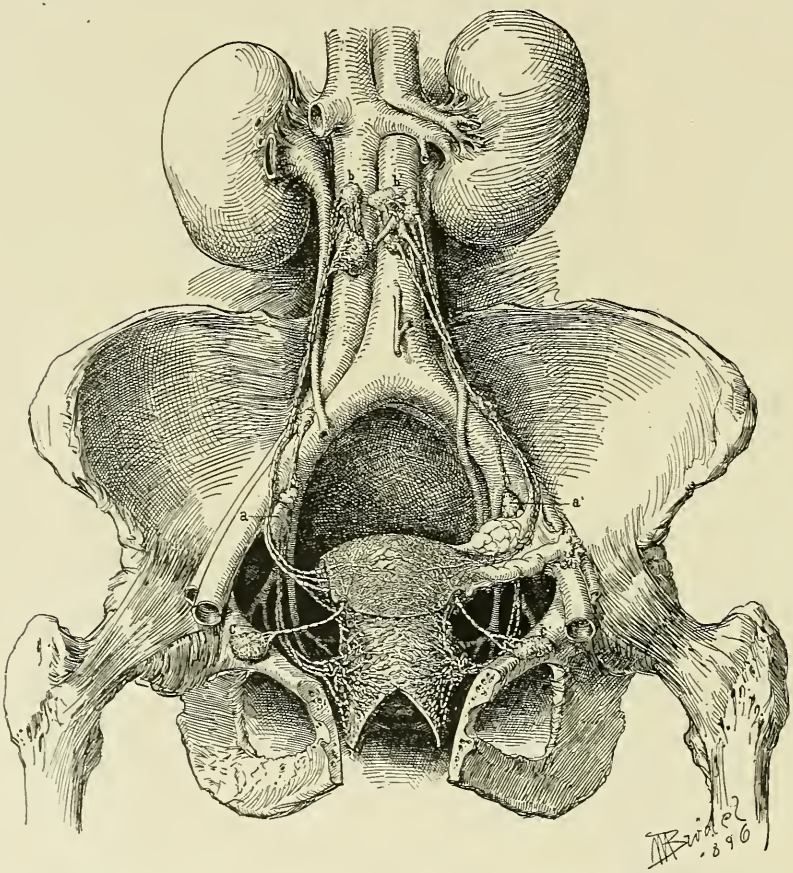
Same case as Fig. 419, a part of the cancerous area magnified, showing the finger-like projections. (Martin.)

upon opposing surfaces. The bladder is involved late in the stage, and the rectum, as a rule, still later. Only in the late stage is the peritoneum invaded. The iliac glands are the first of the lymphatics to be invaded, but these are usually late in being affected, and may entirely

escape. Metastatic growths in distant parts of the body are seldom observed.

2. **Carcinoma of the Cervix.**—Carcinoma of the cervix takes its origin from the epithelium of the cervical mucosa confined within the boundaries of the external os below and the internal os above. The usual site of development is immediately above the external os on the anterior lip.

FIG. 421



Lymphatics of uterus and upper third of vagina, and iliac and lumbar glands. (Russell.)

The carcinomatous growth may involve all or a part of the mucosa. It may assume a nodular or cauliflower appearance, or may infiltrate the underlying tissue. The entire cervix may be infiltrated and will eventually disintegrate, leaving a crater-like structure with a thin shell. The lips of the cervix may close in over the growth, hiding it from view. It is seldom, if ever, that the lips are disintegrated, but in the late stages they are infiltrated and glazed. On cross-section the carcinomatous mass is cartilaginous, yellowish-white, and glistening.

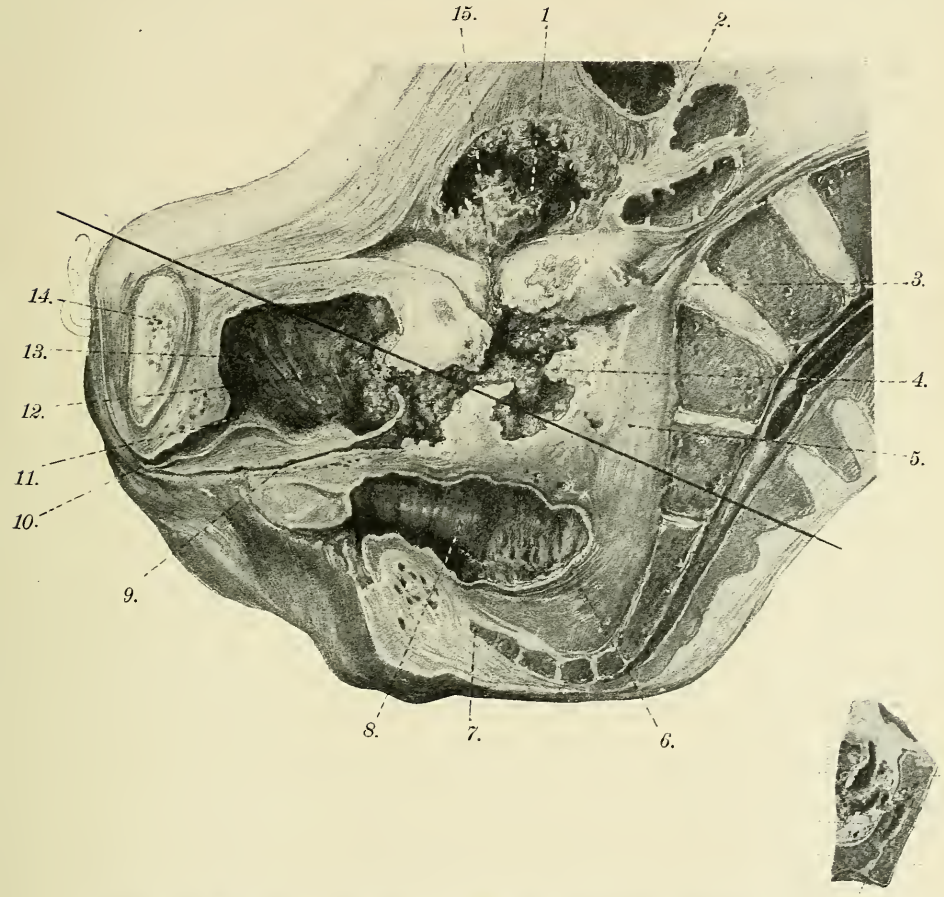
PLATE XXIX

Infiltrating Carcinoma of the Cervix.

The entire cervix is infiltrated and partially disintegrated. In the cavity of the uterus is a fungous growth (fungous endometritis).

The advancing border is irregular and blends into the normal tissue. The body of the uterus and vagina may be invaded either by direct extension or by metastasis. The cervical canal may be occluded by the newgrowth and be followed by fluid distention of the uterus (pyometra and hematometra) and tubes (hydrosalpinx, hematosalpinx, and pyosalpinx).

FIG. 422



Advanced cancer of cervix. Perforation into the urinary bladder and peritoneum. Medial section of the pelvis. 1, perforation of cancerous uterus into the peritoneal cavity; 2, intestine; 3, peritoneum; 4, carcinoma uteri; 5, perirectal inflammatory infiltration; 6, perirectal inflammatory infiltration; 7, coccyx; 8, rectum; 9, vagina; 10, external meatus of urethra; 11, internal meatus of urethra; 12, perforation of cancerous uterus into bladder; 13, urinary bladder; 14, os pubis; 15, perforation of cancerous uterus into peritoneal cavity. (Liepmann.)

Extension of Carcinoma to Surrounding Structures.—The paravaginal connective tissue is invaded comparatively early. It is unusual to observe a case before the broad ligaments are involved, hence the prognosis is always uncertain.

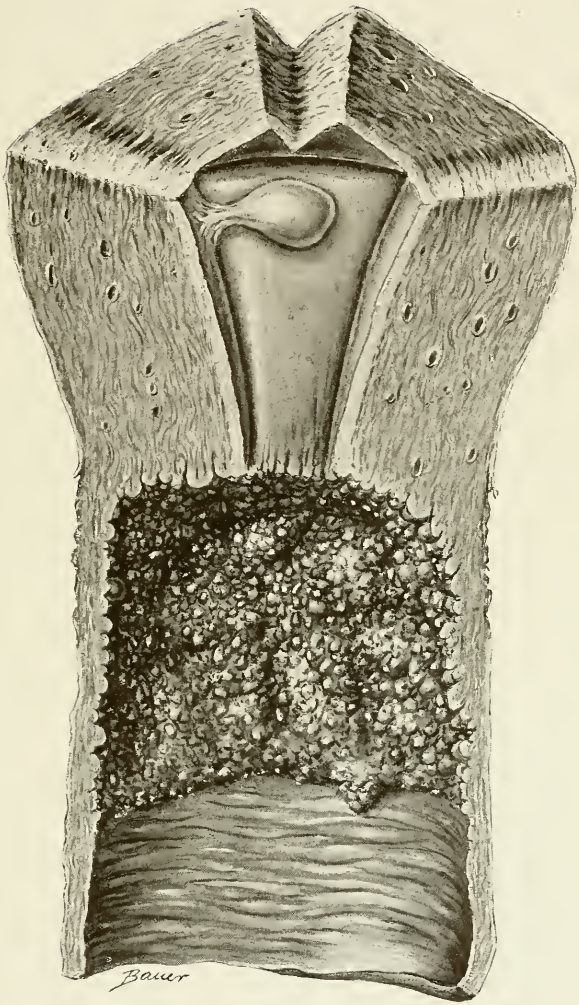
The peritoneal cavity is invaded late. The tubes, ovaries, bladder, and rectum are seldom attacked. The iliacs are the first of the lymphatic glands to be invaded. Metastasis to distant organs is said to seldom occur. Roger Williams, however, found that 20 per cent. of his cases had disseminated cancerous foci in distant parts of the body. Adenopathy has been known to supervene two years before death, though, as a rule, death follows much more closely upon the involvement of the glands. Winter found the iliac glands involved in 22 per cent. of cases of cancer of the cervix. He found four cases of advanced cancer of the cervix without involvement of these glands. Emil Ries has made extended observations on the involvement of the lymphatic glands in cancer of the cervix. He has shown that the glands of the pelvis are often cancerous when no larger than normal. Again, they are sometimes enlarged from hyperplasia, secondary to an ulcerative process in the growth. Extensive glandular involvement contra-indicates all but palliative treatment.

The percentage of glandular involvement in uterine carcinoma is difficult to determine. Peisser estimates that 50 per cent. of uterine cancers are accompanied by glandular involvement, and Williams estimates 72 per cent. These investigations were not verified by the microscope, hence cannot be reliable, for Ries has conclusively shown that there may be no enlargement of the glands in advanced cancerous invasion of the gland structure. Ries further states that the size of the cancer in the cervix is in no regular ratio to the size of the affected gland. He reports a case of his own in which the primary cancer in the vaginal portion was not larger than a thumb nail, but the largest cancerous gland was the size of a pigeon's egg.

It is of clinical interest to inquire whether the parametrium is always involved prior to the pelvic lymph glands. If so, then failure to detect infiltration of the parametrium would lead us to infer that the pelvic glands are not involved, and hence the Ries-Wertheim operation for dealing with the pelvic glands would not be indicated. Puppel, Cullen, Pryor, Kelly, and others are of this opinion, but Wertheim warns us of the uncertainty of such conclusions. The only positive means of demonstrating the presence or absence of cancer cells in the pelvic lymph glands is afforded by serial microscopic sections. Williams points out that in advanced cases of cervical cancer the supraclavicular glands are occasionally enlarged (Trousier's sign). For a more extended discussion of the subject of the lymph glands in uterine cancer see Gellhorn's article in *American Gynecology*, November, 1902.

3. **Carcinoma of the Body of the Uterus.**—Carcinoma may arise from any part of the mucosa of the uterine body, either as a circumscribed or as a diffuse growth. The surface is never smooth. It begins as a shaggy growth studded with delicate villosities, which may later enlarge and coalesce into polyps or form twig-like processes with numerous offshoots. In late and far-advanced cases the growth presents the appearance of brain tissue. The entire uterine cavity may be filled with the cancerous growth. The musculature of the uterus is very

PLATE XXX



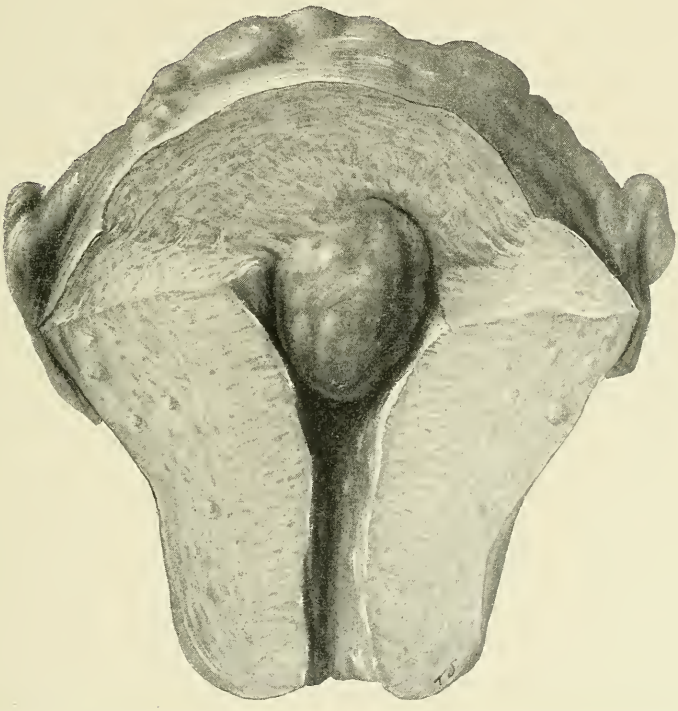
Carcinoma of Cervix, Advanced Stage.

The cervix is almost completely disintegrated. The vaginal surface is intact.

slowly invaded, and it is for this reason that cancer of the body of the uterus is regarded as relatively benign.

On cross-section the invading carcinomatous tissue, with its pale, homogeneous and glistening appearance, is in contrast to the musculature. The advancing border is irregular. When the serous covering of the uterus is invaded, small grayish-yellow nodules are seen beneath the serosa. The growth is usually late in sloughing.

Fig. 423



Carcinoma of the fundus. A large nodule within the uterine cavity and numerous nodules beneath the peritoneum. (Hertzler.)

Extension from the body of the uterus is extremely slow. The internal os is rarely trespassed; the broad ligaments are not infiltrated until late. The peritoneum may be directly invaded, but this is late, if ever. The bladder, rectum, tubes, and ovaries commonly escape invasion. Metastasis to distant parts of the body is late, and may never occur. Kroemer believes that metastasis is more common in carcinoma of the uterine body than of any other part of the uterus.

As to the frequency of carcinoma of the body of the uterus, Schatz says that it occurs in 2.5 per cent., while Schauta says that it occurs in 13.8 per cent. of all carcinomata of the uterus.

Clinical Diagnosis.—A work of this character could do no greater service than to emphasize the importance of an early diagnosis in

carcinoma of the uterus and to point out the methods of making such a diagnosis.

No departure from the normal menstrual flow should be regarded as trivial in advanced years of life. We are not to be content with the supposition that it is a phenomenon of the change of life—too many lives have been sacrificed by such inferences.

It is the family physician, not the specialist, who first sees these cases, and it is to him we must look for the early recognition of the danger, if not for a positive diagnosis. The practitioner must be firm in his demand for a local examination. Ignorance, sloth, prejudice, and false modesty are to be discountenanced. When the physician, after a searching examination into the cause of the hemorrhage, fails to satisfy himself, he should appeal to the specialist, whose services at this time are of greater value than in the treatment of the case, for the reason that it takes greater skill to make a diagnosis in these doubtful cases than it does to remove the uterus after the diagnosis is made. Since the early recognition of carcinoma of the uterus rests upon the microscopic examination of scrapings and excised pieces of the suspected portion, it is self-evident that only those especially trained in the work are competent to make such a diagnosis.

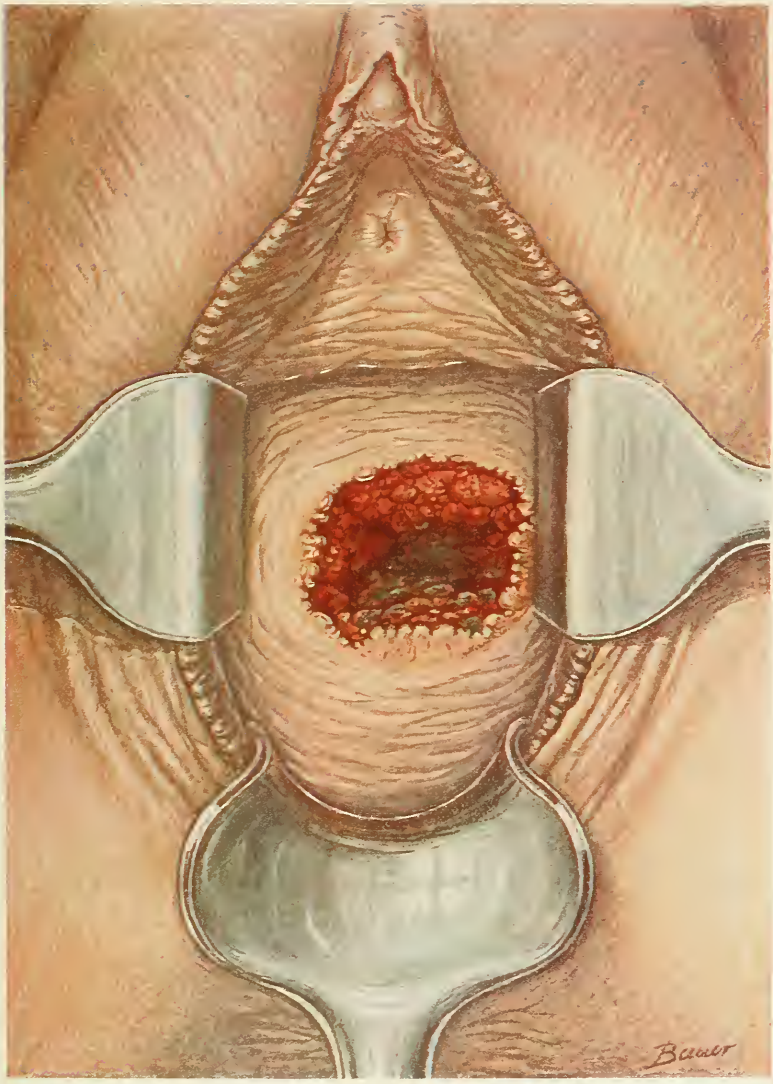
We will here discuss acute and chronic cancers.

Acute Cancers.—Acute cancers, including those which run their course within a year, are frequently met with. Kiwisch observed a case which ran its entire course in five weeks, and Martin's case died within nine weeks of its inception. Associated with the growth in the uterus are febrile symptoms and general dissemination.

Chronic Cancers.—Chronic cancers, including those which run their course in three years or more, are rare. Barker's case continued eleven years. Carcinoma of the uterine body is slow in its course as compared with carcinoma of the cervix or vaginal portion. Odebrecht obtained a permanent recovery by operating on a cancer of the body of the uterus five years and four months after it was known to exist. Symptoms in the early stage, while there is yet time to interfere, are at best only suggestive of the lesion and may be wholly wanting until the disease has reached the inoperable stage. Schauta found that 13 per cent. of the cases which he examined within four weeks of the beginning of symptoms were inoperable.

Hemorrhage.—Hemorrhage is usually the first of the symptoms to appear. It is at first excited by some physical exertion, such as straining at stool, lifting burdens, and sexual intercourse. All departures from the normal menstrual flow, or all losses of blood not in relation to the menstrual period, call for a careful examination. The older the individual the greater the probability of carcinoma. In carcinoma the loss of blood is usually slight at first; more rarely does it begin with a profuse flow. A watery discharge may precede the flow of blood weeks and months, and is highly suggestive of carcinoma. The patient becomes anemic, and her strength fails as a result of the hemorrhage. In the late stage, when there is great enfeeblement, hemorrhage becomes less profuse, and may almost cease.

PLATE XXXI



Cancer of the Vaginal Portion of the Cervix. (Third stage.)

The entire cervix is disintegrated. In the vault of the vagina is an irregular, friable, and bleeding crater. The walls of the vagina are infiltrated.

Leucorrhea.—Leucorrhea is almost invariably present, at first in the form of a watery, odorless discharge, later as a thicker white or yellowish fluid, and, finally, as a stinking, dirty, bloody discharge. Such a discharge can only be regarded with suspicion; it is in no sense pathognomonic, and may be late in making its appearance. Sloughing fibroids, decomposing placental tissue, and senile endometritis may cause a similar discharge. As in hemorrhage, so with such a leucorrhea, a careful examination is imperative.

Pain.—Pain is seldom an early manifestation of carcinoma of the uterus, and is less reliable as a guide to diagnosis than is hemorrhage or leucorrhea. Not infrequently the growth is far advanced before pain is experienced. In such cases the pain begins when the growth has extended beyond the uterus. Pain and hemorrhage are often in inverse proportion. The pain is aggravated by the congestion, and when the flow of blood is considerable the congestion is relieved, and this in turn lessens the pain. Roger Williams found little or no pain in one-seventh of his cases. When present the pain of uterine cancer is generally referred to the groin, thighs, sacral or hypogastric regions. In the early stages the pain is of a dull aching and dragging character. Later, as the adjacent structures are involved, the pain may be severe and constant.

Miscellaneous Symptoms.—Miscellaneous symptoms arise from extension to the surrounding structures. The bowels become constipated, and defecation is painful from the pressure of the growth. As the rectum is invaded a mucous or mucohemorrhagic discharge comes from the rectum; finally, a rectovaginal fistula develops. Invasion of the bladder causes frequent urination, irritability of the bladder, bloody urine, and, finally, a vesicovaginal fistula.

When the cellular tissue of the pelvis is involved there may be pain referred to the groin, thighs, and legs. Edema of the legs, often of one side, may result from an involvement of the veins and lymphatics of the pelvis. In almost every case of advanced carcinoma of the uterus the kidneys are involved and uremic symptoms may be manifest.

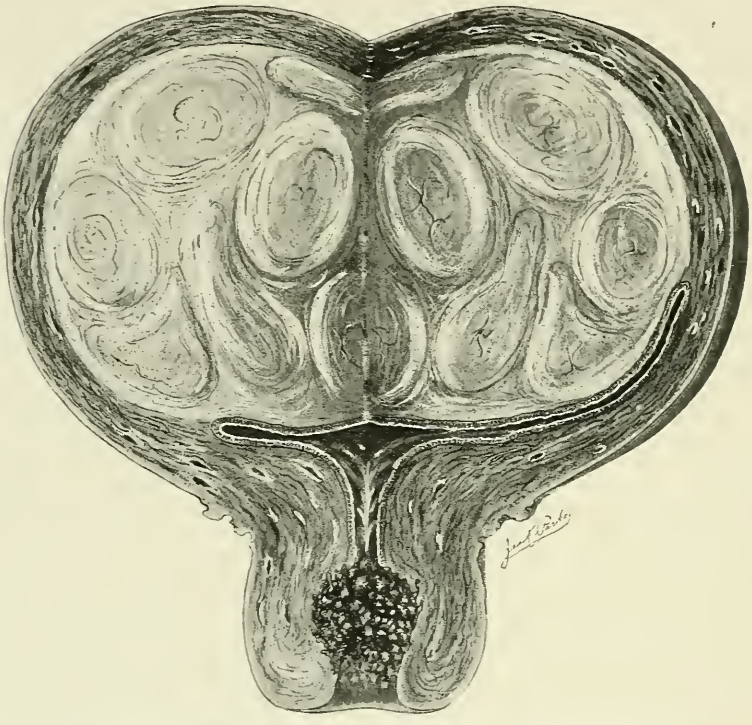
Cachexia.—Cachexia develops in the advanced stage, though it may be surprisingly late in making its appearance. The above symptoms are responsible for the cachexia.

Uterine cancer patients seldom take to their bed until at least half of the course of the disease is run. Occasionally the general health fails from the beginning of the lesion, and on the other hand death has been known to result from the disease without marked general symptoms. A gradually increasing asthenia usually brings the case to a fatal termination.

I. **Diagnosis of Cancer of the Vaginal Portion of the Cervix.**—The diagnosis of carcinoma of the vaginal portion of the cervix can be made with greater ease and certainty than in any other portion of the uterus, because of the greater accessibility to touch and sight. In the infiltrating form, with an overlying covering of mucous membrane, the diagnosis is difficult without the aid of the microscope.

The broadening of the cervix, the irregular nodular surface, the cartilaginous consistency, and the glistening, bluish color are not sufficiently characteristic. The friability and tendency to bleed when grasped by a tenaculum or when the finger nail is gouged into it, are regarded by many gynecologists as characteristic of cancer, and altogether reliable in making a diagnosis.

FIG. 424



Primary carcinoma of the cervix; associated with a large submucous fibroid.

While much reliance can be placed on these signs, the microscopic examination of an excised piece of the suspected portion must be regarded as the conclusive test, without which a positive diagnosis is often impossible. When ulceration is present the diagnosis is made with greater ease. The hard, glistening, irregularly elevated border, together with the friability and tendency to bleed when handled, leave little doubt as to the carcinomatous nature. There is then little need for the microscope to confirm the diagnosis.

A cauliflower growth is more readily recognized as malignant than the infiltrating form, yet papillary erosion must be excluded, and to make a careful differentiation, the microscope will often be found indispensable. The greater the clinical experience of the examiner, the larger will be the percentage of cases in which the diagnosis can

be made from the clinical signs and symptoms. But there will remain a certain number in which the diagnosis can only be made by a microscopic examination of an excised piece of the suspected portion. (See Microscopic Diagnosis, page 133.)

II. **Diagnosis of Carcinoma of the Cervix.**—The diagnosis of carcinoma of the cervix is rarely made early, because the growth is not accessible to the sense of touch or sight, hidden as it is above the external os. Indeed, the growth may go on to an advanced stage, destroying the mucous membrane and underlying connective tissue, and yet be unsuspected. When the destruction of tissue is seen through a vaginal speculum the diagnosis is not difficult, but this is not possible in the early stage when a radical cure is reasonably assured.

When the cervix is artificially dilated bleeding is profuse and tearing can scarcely be avoided. The finger or curet gouges out friable masses. The friability and bleeding of the tissue are so characteristic as to leave little doubt of the carcinomatous nature of the growth. It is scarcely necessary to resort to the microscope to confirm the diagnosis.

III. **Diagnosis of Carcinoma of the Body of the Uterus.**—The diagnosis of carcinoma of the body of the uterus presents the greatest possible difficulties. There are no symptoms that may be regarded as pathognomonic; the lesion is beyond the reach of the examining finger, and cannot be brought under inspection. The general nutrition of the individual bears little relation to the stage of the growth. She may retain her weight into the last stage.

Hemorrhage, a foul-smelling discharge, and pain usually occur in the order named, but it is possible for one or all of these symptoms to be absent, and more often there is nothing in the symptoms to suggest anything more serious than endometritis.

If every menstrual irregularity occurring late in life and every intermenstrual or postmenopausal hemorrhage were regarded with suspicion of carcinoma, and a thorough search made into the cause, few carcinomata of the uterus would long go unrecognized.

It is usual for the menstrual periods to have been regular, for the menopause to have passed in the ordinary way, and for some months or years to have intervened before the appearance of hemorrhage. The author has seen a case in which the menopause had been passed forty-eight years when hemorrhage returned. Even with this long interval the patient and friends thought the loss of blood was due to a return of the menses. Their suspicions were confirmed to their entire satisfaction when the flow of blood ceased in a few days and returned in four weeks. This disposition on the part of the patient to believe that postmenopausal hemorrhages are the return of the menses is too frequently responsible for the high rate of mortality in carcinoma of the uterus.

There is little difference in the subjective signs of carcinoma of the body of the uterus and those of the cervix or vaginal portion. The constitutional effects appear much slower. It is impossible to say

when the growth begins. We commonly date the appearance of the carcinoma from the time of the onset of the watery discharge or hemorrhage, but it is to be borne in mind that these symptoms may be due to endometritis which has not as yet developed into a malignant growth; and, on the other hand, these symptoms may follow weeks and months after the beginning of malignant degeneration. The slow growth of carcinoma of the body of the uterus is illustrated by a case of Cullen's, in which a hysterectomy was performed two years after the onset of symptoms, and the disease was seen to have made little progress.

In a case operated upon by Dr. J. Clarence Webster the symptoms began three years previous to the operation. The growth was still apparently confined to the body of the uterus.

We now see that the subjective signs cannot be relied upon in making a diagnosis, and that we must depend largely upon physical signs.

Bimanual palpation of the uterine body shows a slight uniform enlargement, together with some degree of softening. In the early stage the size and consistency of the uterus are not changed. In the advanced stage, when the growth has extended to the serosa, small nodules may be palpated on the outer surface of the uterus, giving the impression of small subperitoneal fibroids. (See Fig. 386.)

Exploration of the uterine cavity is essential to a positive diagnosis. This is accomplished by the examining finger, the sound, or the curet.

After dilating the cervix sufficiently to admit the index finger, the entire surface of the endometrium can be explored. Soft, friable, and irregular elevations upon the surface are located, and may be scraped off by the finger for a microscopic examination. It is possible in the early stage for a growth that is not distinctly raised above the surface to escape detection by the examining finger.

The uterine sound will detect the irregularities upon the surface of the endometrium with less certainty, and will afford much less intelligent information regarding the consistency and extent of the growth. In carcinoma the sound will sink into the soft growth and cause considerable bleeding.

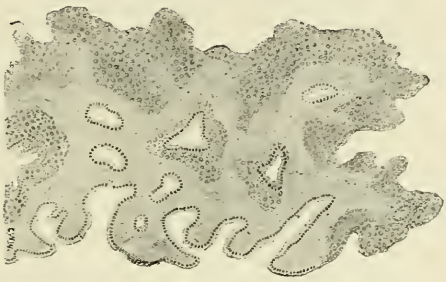
An exploratory curettage, followed by a microscopic examination of the scrapings, will supply an absolute means of making a diagnosis, and should be made in every case, no matter what the other findings may be.

Microscopic Diagnosis.—An early diagnosis of carcinoma of the uterus is seldom made from clinical manifestations or from the naked-eye appearances of the growth. The only positive means of making an early diagnosis is by a microscopic examination of excised pieces and of scrapings removed by the curet.

I. **Carcinoma of the Vaginal Portion of the Cervix.**—In advanced cases when there is ulceration of the cervix and when the vagina and parametrium are infiltrated, a microscopic examination is seldom necessary. In the early stage no characteristic features may be observed by the naked eye, and it is in such cases that the microscope is indispensable. The technic of excising a piece of the cervix for a microscopic exami-

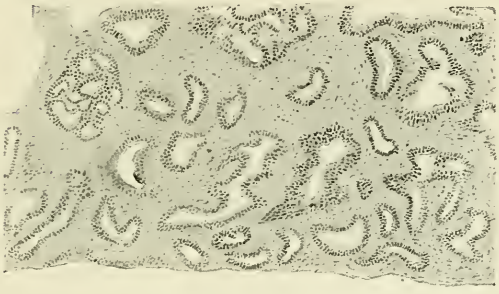
nation is to sterilize the vagina as for a vaginal operation; grasp the cervix with a tenaculum, and with knife or scissors remove a wedge, including part of the suspected portion and part of the apparently

Fig. 425



Papillary erosion of cervix undergoing malignant degeneration.

Fig. 426



Adenocarcinoma of the cervix.

Fig. 427

Papillary carcinoma of the cervix.

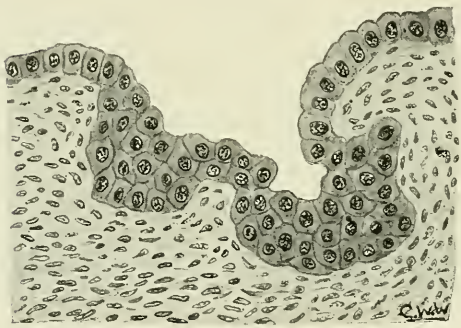
healthy tissue. Following the incision catgut sutures are used to close the wound, and the vagina is packed with gauze. An anesthetic is desirable, though not absolutely necessary.

The microscopic appearance of an infiltrating squamous-cell carcinoma of the cervix is that of many layers of flat epithelium, varying

FIG. 428

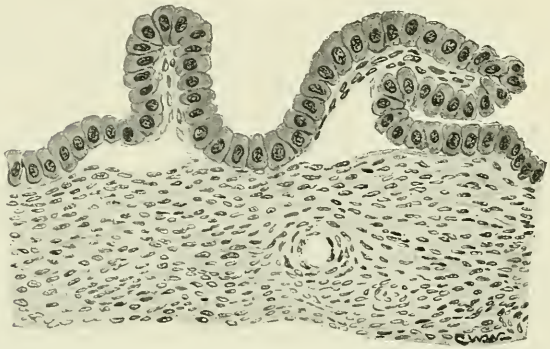
Squamous-cell carcinoma of the cervix.

FIG. 429



Proliferation of the superficial columnar epithelium. The new-formed epithelium is seen to invade the connective tissue in the act of forming a malignant gland.

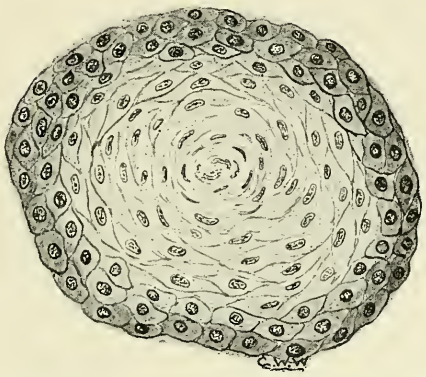
FIG. 430



Proliferation of the superficial columnar epithelium. The new-formed epithelium extends outward, forming papillary projections into which connective-tissue fibers grow to form a framework. There is no invasion of the connective tissue. The figure represents the beginning of a malignant papillary growth.

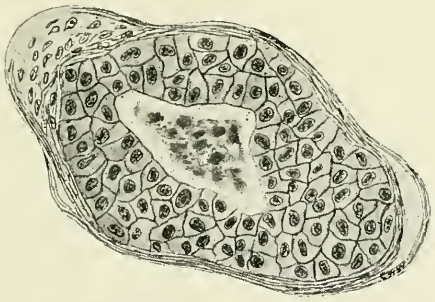
greatly in size and in form from the normal epithelium of the vaginal portion. The cells may be no larger than a leucocyte, or considerably larger than normal. The nuclei are relatively large, and often segmented. They take a deep stain and show many karyokinetic figures. A variable amount of protoplasm surrounds the nuclei. The cells, grouped in irregularly projecting columns, invade the underlying tissues and may finally wholly replace the cervix. About the margins of these projecting columns is a round-cell infiltration of the connective-tissue stroma. Cross-sections of these epithelial columns appear as "cancer nests" (Fig. 432), and in them "cancer pearls" (Fig. 431) are usually found.

Fig. 431



Cancer pearl composed of concentric layers of hornified epithelium.

Fig. 432



Cancer nest with a necrotic centre.

The microscopic diagnosis of a cauliflower carcinoma of the vaginal portion of the cervix is to be made from an excised piece of the suspected portion. The sections must be made perpendicular to the cervix, in order to observe the epithelial invasion of the latter. The finger-like projections which aggregate to make a cauliflower growth are composed of a framework of connective tissue which contains a central blood-vessel, many round cells, and a variable number of invading epithelial

cells (Fig. 433). The surface is covered with many layers of squamous epithelium not unlike those described above in the infiltrating form of carcinoma. The epithelium invades the underlying connective tissue of the cervix, and it is this feature that gives the malignant character to the growth. Cancer nests may show various stages of degeneration. Giant cells are relatively abundant. Hyaline degeneration of the cancer cells is common, and the nuclei may be fragmented.

Fig. 433

A finger-like projection of a squamous-cell carcinoma of the cervix.

Erosion carcinoma is a term implying malignant degeneration of an erosion of the cervix. The malignant changes commonly begin on the surface of the erosion, less frequently from the glands and follicles. In this way it is possible to have a cylindrical-cell carcinoma in the vaginal portion of the cervix.

II. **Carcinoma of the Cervix.**—Two general histological forms of carcinoma of the cervix are recognized, alveolar and glandular. These

forms take their origin from the surface epithelium or from preëxisting glands. In either form the wall of the cervix may be deeply infiltrated and the cervical canal filled. Ruge and Veit describe a budding process in the development of malignant gland formations. Groups of epithelial cells bud from either side of the lumen of a gland and unite to form a bridge across the gland. Eventually the lumen of the gland may be filled with epithelial cells. In no essential way does carcinoma of the cervix differ from carcinoma of the body of the uterus.

III. **Carcinoma of the Body of the Uterus.**—In carcinoma of the body of the uterus we see a great variety of histological forms. In general there are found the adenocarcinoma and the alveolar, very rarely the squamous-cell carcinoma.

Adenocarcinoma may assume a type sometimes spoken of as malignant adenoma—*i. e.*, a glandular growth in which the glands are greatly increased in number and invade the musculature. There is but a single layer of epithelium, and the glands are very irregular in outline and often increased in size. It is difficult to differentiate an early malignant adenoma from an advanced type of hyperplastic glandular endometritis, or what is sometimes called a benign adenoma. Gebhard describes two varieties of malignant adenoma—the everted form, in which the gland irregularities project outward from the lumen, and the inverted form, in which the irregularities project into the lumen of the gland. The two forms are often combined.

When, in addition to irregularity in outline and great increase in the number of the glands, the epithelium proliferates to form two or more layers and the basement membrane is broken through, we have formed the adenocarcinoma.

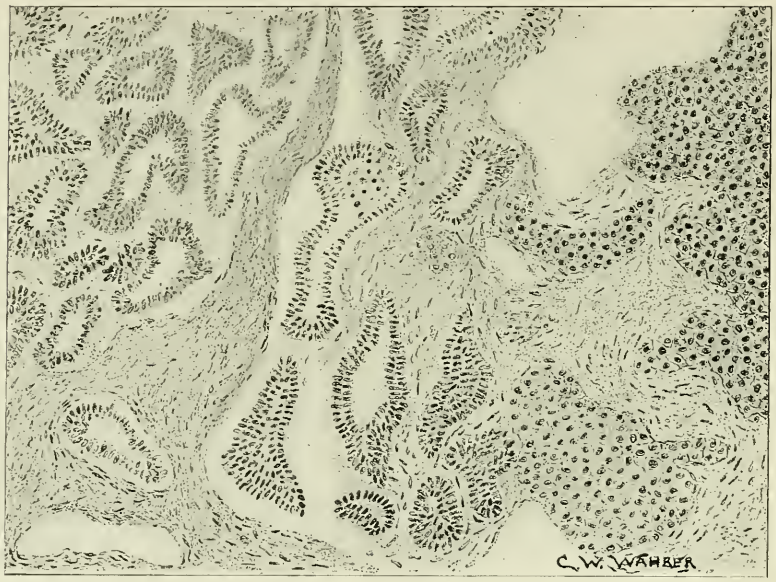
Alveolar carcinoma may form by the complete filling up of the gland lumen in the advanced stage of adenocarcinoma, or the surface epithelium may invade the underlying tissue, giving rise to the formation of "cancer nests."

Squamous-cell Carcinoma of the Body of the Uterus.—There are but few authentic cases of squamous-cell carcinoma of the body of the uterus reported. To deny the possible existence of such growths, as does Cullen in his admirable work on *Cancer of the Uterus*, is unwarranted from a study of the recorded cases. That multiple layers of squamous epithelium of a perfectly benign character are found has been well established by Veit, Gebhard, Ries, and others. It is only reasonable to infer that such benign metamorphosis may in turn become transformed into squamous-cell carcinomata.

Zeller, in 1885, observed in the scrapings of all forms of endometritis, isolated areas of stratified squamous epithelium showing none of the characters of a malignant growth. Gebhard and Menge made similar observations in gonorrheal endometritis. Werth examined the mucosa ten days after curettage, finding islets of squamous epithelium in the mouths of glands. Gottschalk and Winkler record similar observations in the endometrium of pregnancy in the fifth and third months respectively. Opitz and Gebhard found small papillary elevations in the

decidua, composed of three or four layers of squamous cells. Meier and Friedländer made observations on the uteri of fetuses and infants, in which they demonstrated isolated patches of squamous epithelium, four to six layers in thickness, the lowermost layer being cylindrical, the uppermost layer hornified, and the intermediate layer cubical in form. Huegge reports two cases, forty-four and forty-nine years of age, in which curettage was performed for the control of hemorrhage. Transformation and proliferation of the epithelium into stratified squamous epithelium was found in both specimens.

Fig. 434



Combination of squamous-cell carcinoma and adenocarcinoma of the corpus uteri.

In none of the above recorded cases was there evidence of malignancy. The benign metamorphosis occurred from the ninth month of fetal life to the forty-ninth year. Bebkiser, Hofmeier, and Gebhard each described a case in which the benign stratified epithelium became transformed into a malignant squamous epithelial growth. Kaufman curetted the uterus of a woman, aged sixty-four years, who had suffered from uterine hemorrhage six years. In the scrapings were typical fields of adenocarcinoma, together with nests of squamous-cell carcinoma containing cancer pearls.

It is probable, as Winter says, that these growths never arise directly from cylindrical epithelium. It is more likely that through mechanical, chemical, and mytotic influences the cylindrical cells proliferate, become flattened, and subsequently undergo malignant transformation.

Fig. 434 is drawn from a specimen removed by Dr. J. Clarence

Webster in the Presbyterian Hospital of Chicago. In the specimen is an interstitial fibroid of the uterine body lying directly posterior to a cauliflower growth of the endometrium. This endometrial growth is about two inches in diameter, is soft and friable, and shows no visible degenerative changes. The remainder of the endometrium is apparently normal. Microscopic sections show an adenocarcinoma. Typical in form and intimately associated with malignant glands are areas of apparently squamous-cell carcinoma. In the field will be seen glands partially filled with flat epithelium, and cells showing transition stages from the cylindrical to the flat cells. No cancer pearls are found. After a thorough search throughout the endometrium, not involved in the cauliflower growth, no evident metamorphosis of the surface epithelium could be found. It is probable that the existence of the flat epithelium may be accounted for by the presence of the encroaching fibroid—a result of pressure.

I. **Differential Diagnosis.—Vaginal Portion of the Cervix.**—*Carcinoma of the vaginal portion of the cervix* is to be differentiated from eversion of the mucous membrane, erosions of the cervix, decubitus, tuberculous and syphilitic ulcers, follicular degeneration of the cervix, metritis coli, and sarcoma.

Eversion of the mucous membrane of the cervix follows laceration of the cervix. Viewing the cervix through a speculum, the eversion is often exaggerated by the traction made by the speculum upon the cervix. Grasping the two everted lips of the cervix with tenacula and bringing them together, the everted mucous membrane is rolled in, leaving a normal appearing cervix. The suspected portion is not friable and does not bleed freely when handled. Finally, if a section of the everted mucosa is examined under the miscrocope it is seen to be either normal or hypertrophied. There is no evidence of an epithelial invasion of the underlying tissue.

Erosion of the cervix (mucous patch) may be confused with carcinoma when having a papillary surface or when deeply indurated. Erosions seldom bleed so freely as does carcinoma, and the tissue is less friable. When doubt exists a microscopic examination of an excised piece of the suspected portion will confirm the diagnosis. No epithelial invasion will be found beneath the basement membrane.

Decubitus ulcers of the cervix, due to pressure from ill-fitting pessaries and friction of the cervix and thighs in prolapsus uteri, are recognized by their punched-out appearance, the absence of hard, elevated margins, the granular bed in the absence of induration, and, finally, by a microscopic examination of excised pieces of the ulcer in which there is found no epithelial invasion of the underlying structures. On removal of the pessary and replacing the prolapsed uterus, there is a tendency to healing which is never present in carcinomatous ulcers.

Tuberculous ulcers of the cervix are rare as compared with carcinoma. A tuberculous family history, the presence of tuberculosis elsewhere in the body, and particularly in the upper genital tract, will suggest the possible nature of the lesion. The tuberculous ulcer has a ragged,

undermined margin in contrast to the hard, elevated margin of a carcinomatous ulcer. The bed of the ulcer is not indurated as in carcinoma, and may be studded with tubercles and covered with a yellowish secretion. Miliary tubercles may surround the margins of the ulcer. There is not the tendency to bleed when handled, nor is the tissue so friable as in carcinoma. Finally, a microscopic examination of excised pieces will reveal the tubercles, giant cells, and possibly the tubercle bacillus, and there will be an absence of deep invasion of the epithelium. There is a tendency to heal by cicatrization not seen in cancerous ulcers.

Beyea speaks of ulcerative, miliary, papillary, and hyperplastic tuberculous endocervicitis. Papillary tuberculous endocervicitis, according to Beyea, is distinguished from a cauliflower carcinoma by the following:

1. Not bleeding so freely or so early as carcinoma.
2. More elastic and velvety and less friable than is carcinoma.
3. Commonly occurring during the period of sexual maturity while carcinoma occurs later.
4. Great variations in history and in duration.
5. Microscopic examination showing lesions typical of tuberculosis and the absence of epithelial invasion.

A syphilitic ulcer is single, shallow, and deeply indurated; the bed of the ulcer may be covered with a grayish-yellow deposit, and the margins are not elevated but are described as serpiginous. The discharge is slight. There is a tendency to heal by cicatrization. Multiple ulcerated papules may be present. Under the microscope there is noted an absence of epithelial invasion of the cervix. Secondary syphilides assume the form of erosions and condylomata. There is usually an absence of induration and the lesions are multiple. These characteristics, together with the history and the presence of syphilitic lesions elsewhere in the body, should render the diagnosis possible.

Tertiary syphilitic affections of the portio are found in the form of gummata, more or less diffuse fibrosis, and ulcers. The ulcers may appear gangrenous and lead to confusion in the diagnosis. Nothing short of the Wassermann test, of antisyphilitic treatment and a microscopic section of the ulcer can determine the true nature of the lesion.

Follicular degeneration of the cervix, or what is commonly known as a follicular erosion, is described on page 417. The cervix may be much enlarged, irregular, and nodular. Cutting into the irregular elevations, inspissated mucus escapes. The suspected tissue is tough, not friable as in carcinoma, and does not bleed when handled. The microscope shows distended glands, with an intact, overlying mucosa, not invading the underlying connective tissue.

An interstitial fibroid of the cervix is commonly associated with similar growths in the body of the uterus. The tumor is firm, sharply circumscribed, and shows no tendency to friability and bleeding. On cross-section and under the microscope a fibrous or fibromuscular structure is seen.

Metritis coli is a chronic inflammation of the cervix causing such thickening and hardening of the tissue as to suggest malignant infil-

tration. The enlargement is uniform as contrasted with the irregular growth of the carcinomatous cervix; there is an absence of the cartilaginous firmness of the cervix of the first stage of carcinoma, and there is no bleeding on handling. In doubtful cases a section of the suspected tissue should be submitted to the microscope.

Sarcoma of the cervix cannot be diagnosticated from carcinoma without the aid of the microscope. The clinical history and the naked-eye appearance of the growth will not suffice for a diagnosis.

Abel lately claims to have hit upon a valuable diagnostic point in squamous-cell carcinoma of the cervix. He finds by the Weigert resorcin-fuchsin stain the presence of elastic fibers surrounding the nests of the epithelium and running between individual epithelial cells. In benign epithelial growths, such as condyloma of the cervix and papillary erosions, elastic fibers are found at the margins of epithelial groups and do not run between individual cells.

II. **Carcinoma of the Cervix.**—The differential diagnosis of carcinoma of the cervix is made from mucous polyps, submucous fibroids, and cystic degeneration of the glands of the cervix. In all of these the absence of friability, the slight bleeding when handled, and a microscopic examination of the suspected tissue determine conclusively the diagnosis.

III. **Carcinoma of the Body of the Uterus.**—The differential diagnosis of carcinoma of the body of the uterus is from endometritis, submucous and interstitial fibroids, retained placental tissue, syncytioma malignum, hydatiform mole, arteriosclerosis, sarcoma, and endometritis.

Endometritis may closely resemble carcinoma of the body of the uterus in its clinical manifestations and in its macroscopic and microscopic appearances.

The symptoms of endometritis may be identical with those of carcinoma. In both of these lesions all symptoms may be absent or so insignificant as not to concern the patient.

A naked-eye examination of the endometrium, after removal of the uterus or of scrapings from the uterus, while sufficiently characteristic in many cases, may be altogether misleading. It not infrequently happens that the only way to make a positive diagnosis is by the aid of the microscope.

Indeed, it is only by an exploratory curettage and a microscopic examination of the scrapings that an early diagnosis of carcinoma of the uterus can be made.

Carcinoma of the body of the uterus is so insidious in its development and so slow in its progress that it becomes imperative to regard with suspicion all hemorrhages, however slight, when occurring late in life, and to advise an exploratory curettage when the cause of the hemorrhage is not accounted for.

In making a microscopic examination of suspected scrapings from the uterus we are to determine whether the glands are more irregular in outline than the glands of hyperplastic and hypertrophic endometritis; whether they are so increased in number as to do away with

the interglandular connective tissue to an extent not observed in endometritis, and, finally, whether the epithelium has broken through the basement membrane and is found within the interglandular connective tissue. These three findings—that is, great irregularity of the glands, great increase in number of the glands, and proliferation of the epithelium beyond the basement membrane—serve to distinguish adenocarcinoma and malignant adenoma from glandular endometritis. One, two, or all three of these features may be found, and are to be regarded as characteristic. The last, however, is by far the most reliable. Occasionally there will be found a specimen the character of which cannot be determined with certainty. Such cases should either be treated as if malignant or should be kept under close observation.

Submucous and interstitial fibroids may present all the clinical evidences of malignancy. This is especially true in gangrene of a fibroid tumor. Hemorrhage, leucorrhea, pain, and emaciation may all be in evidence, and suggest the presence in the uterus of a malignant growth. An exploratory curettage and a microscopic examination of the removed particles will establish a diagnosis.

A fibroid bulging into the uterine cavity may be identified by the sound, curet, or the examining finger. It is to be borne in mind that fibroids and carcinoma may coexist in the body of the uterus, and we are not to be content with the finding of any single cause for the symptoms, but are to exclude all possible causes.

Retained placental tissue may remain in the uterus an indefinite length of time—weeks, months, and years after the termination of labor and abortion. Hemorrhage, leucorrhea, and pain may result, giving a clinical picture that may be mistaken for carcinoma of the body of the uterus. The lesion is most likely to be found during the period of sexual maturity, while the symptoms of carcinoma of the uterine body seldom appear before the climacteric period, and more often some time after the menopause.

A positive diagnosis can only be made by an exploratory curettage and a microscopic examination of the scrapings. In recent cases the placental tissue may be recognized by the naked eye, but in cases of long standing, mere shadows of placental tissue may be recognized by the microscope. The presence of decidual cells and chorionic villi in the scrapings determines the diagnosis.

The glands of pregnancy are so varied and irregular in form as to suggest the possibility of malignancy when pregnancy has not been suspected. The interglandular connective tissue may be almost entirely lost by pressure of the enlarged glands. The glands seldom run at right angles to the surface and may run almost parallel. Their outlets are constricted by the surrounding decidual cells, while their deeper portions are widely distended. As a rule, a single layer of epithelium lines them, but more than one layer is occasionally found. The epithelium is flattened or cuboidal. A number of layers of flat epithelium have been observed in the glands. There is, however, no invasion of

the interglandular connective tissue by the epithelium, and herein lies the differentiation from malignant glands. The finding of decidual cells surrounding the glands will suggest their character.

Mucous polyps of the uterus are frequently the cause of hemorrhage. While more common during the age of sexual maturity, they may be found at any age, even years after the menopause. The microscopic picture does not differ essentially from that of endometritis. The absence of epithelial proliferation and invasion of the underlying connective tissue will exclude carcinoma.

The decidua of ectopic pregnancy may be confused with carcinoma when pregnancy is not suspected. The scapings from the uterus of an ectopic pregnancy may appear to the naked eye not unlike those of a carcinoma. Viewed under the microscope no doubt should arise. In association with the decidual cells are the glands of pregnancy, giving a picture not to be confused with carcinoma.

Tuberculous endometritis may closely simulate carcinoma in its clinical and anatomical features. Tuberculosis of the endometrium usually occurs early in life as compared with carcinoma of the uterus. There may be a family history of tuberculosis, or tuberculous foci may be found elsewhere in the body. If found in the tubes it is suggestive that the endometrium is involved. In exceptional cases the diagnosis can be made from cover-slip preparations of the leucorrheal discharge. To the naked eye the endometrium may present characteristic ulcers and tubercles, but in general it may be said that, in the absence of tuberculosis in other portions of the genital tract, the lesion can only be diagnosticated from the usual forms of endometritis or carcinoma by microscopic examinations of sections taken from the uterus after removal, or from scrapings. The finding of tubercles, giant cells, or tubercle bacilli and the absence of epithelial invasion of the connective tissue will complete the diagnosis. The picture is distinctly that of an inflammatory reaction.

Diagnosis of Extension.—It is of prime importance to determine whether or not the carcinoma is confined to the uterus. This should always be done before the diagnosis can be considered complete and before determining upon radical procedures in treatment.

It is now generally conceded that the entire uterus must be removed for carcinoma involving any part of the organ; hence it is no longer a question as to how much of the uterus is involved in the growth, but rather as to whether it is confined to the uterus or has spread to the surrounding structures. We look to the parametrium, vagina, bladder, rectum, lymph glands, and internal organs for secondary growths.

The parametrium, particularly that portion of the cellular tissue found between the layers of the broad ligaments, is usually involved comparatively early. In carcinoma of the cervix and vaginal portion the base of the broad ligament is invaded. Sampson says that the parametrium is the blood-vascular and lymph hilus of the uterus, in that it is in direct relation with the cervix. It is here that cancer of the cervix first spreads, whether the extension is by direct continuity

of tissues or by metastasis. Wertheim found the parametrium invaded in 47.5 per cent. of his cases, and in more than half of this number the lymph glands were not involved. The infiltrated tissue is felt as a "board-like" mass, irregular and nodular in outline, firmly fixed, and not tender to pressure. The cervix is crowded in the opposite direction.

The examination is best made under anesthesia. Two fingers are placed in the rectum, the thumb in the vagina. Counter-pressure is made over the abdomen by the other hand. The cervix and area of infiltration will be found as one mass. The cervix will be immovable. This immobility of the cervix does not necessarily signify a carcinomatous invasion; it may well be inflammatory.

Inflammatory swellings of the tubes and ovaries, fixed by the side or behind the uterus, may be mistaken for carcinomatous infiltration. Such swellings are more tender to pressure, are less cartilaginous in consistency, have not the same intimate connection with the cervix, and are commonly located on a higher plane.

Still greater difficulty is experienced in differentiating carcinomatous infiltration of the parametrium from pelvic cellulitis. In the latter there is greater tenderness, the outline is flatter and less nodular, and there may be no direct and immediate connection between the carcinomatous lesion in the uterus and the infiltrated parametrium. The cervix is crowded away from the growth, while in parametritis the cervix is drawn to the infected side.

It is difficult to demonstrate carcinomatous infiltration of the connective tissue occupying the vesico-uterine space. Usually it is not possible until an incision is made into the region. The uterosacral ligaments may be infiltrated. The characteristics of the lesion and the differentiation from an inflammatory involvement of the same structures are as found in a like invasion of the broad ligaments.

The vagina is invaded by direct extension, seldom by metastasis.

Since carcinoma of the vaginal portion more often begins in the anterior lip, the anterior wall of the vagina is frequently first attacked. The infiltrated vaginal wall is readily recognized by the finger and by examination through the speculum. The infiltrated area in the vagina is directly continuous with the growth in the cervix. The margins of the infiltrated area are elevated, hard, and irregular. Ulceration follows in the late stage, and such ulcers show the irregular, elevated margins and the uneven base which bleeds freely on being touched. Metastatic growths may be found at any point in the vaginal walls, more often in the posterior wall. Such growths are hard and nodular, and may attain the size of a walnut.

When the paravaginal tissue is infiltrated it is possible to move the vaginal mucous membrane independently of the underlying growth.

Spiegelberg's sign is of some value in recognizing a carcinomatous infiltration beneath an intact mucous membrane. Passing the finger over the surface the mucous membrane feels like wet rubber, having lost its normal pliability.

Invasion of the bladder is secondary to that of the anterior wall

of the vagina. It is clinically recognized by frequent and painful urination, blood in the urine, and finally, by the dribbling of urine into the vagina through a vesicovaginal fistula. An early diagnosis is made by a cystoscopic examination. The area of infiltration and the ulcers are distinctly seen, and when associated with advanced carcinoma of the cervix, there can be no hesitancy in making the diagnosis of extension of the carcinoma to the bladder.

The rectum is invaded after the growth has spread to the posterior vaginal wall. The symptoms indicating invasion of the rectum are a mucous discharge which is often stained with blood, rectal tenesmus, constipation alternating with diarrhea, and a discharge of feces into the vagina after the development of a rectovaginal fistula. A digital exploration of the rectum and vagina reveals a hard, infiltrated area in the rectovaginal septum, which bleeds and may crumble to the touch; the mucous membrane of the rectum has lost its pliability, and cannot be moved independently of the underlying structures; finally, a section removed for microscopic examination determines the diagnosis.

Metastatic growths are seldom early in making their appearance. Experience teaches us that it is never possible to say with absolute certainty that metastasis has not occurred, even in the apparently early growths. The ovary is sometimes the seat of metastasis. Of the abdominal and thoracic viscera, those most often involved are the lungs and liver. In carcinoma of the uterine body the lumbar glands are first involved. If the horn of the uterus is invaded the deep inguinal glands may be attacked by way of the round ligaments. In carcinoma of the cervix, vaginal portion of the cervix, and upper segment of the vagina, the iliac glands which lie in front of the sacroiliac synchondrosis at the bifurcation of the common iliac vessels, are first invaded.

In carcinoma of the vulva and lower segment of the vagina the inguinal glands are first attacked. It is of the greatest importance to recognize involvement of the lymphatic glands in settling the question of operative interference.

The diagnosis of recurrence after removal of the uterus is of great importance. A recurrence implies failure in the attempt to thoroughly remove the primary focus.

Winter speaks of local recurrence when the secondary development is in or near the previous field of operation; of lymph gland recurrence when the lymphatic glands of the body are involved subsequent to the operation, and of metastatic recurrence when the carcinoma spreads to distant parts of the body. In the great majority of cases the recurrence is local and multiple. Hache gives the following statistics relative to the time of recurrence of carcinoma after hysterectomy:

Under three months	19.4 per cent.
Three to six months	18.0 per cent.
Six to twelve months	18.1 per cent.
One to two years	22.3 per cent.
Two to three years	14.6 per cent.
Over three years	7.6 per cent.

The above statistics were based upon a study of 144 cases. Pamard reports the return of a cervical cancer fifteen years after removal of the primary growth. We may state as a general rule, to which there are few exceptions, that recovery is assured after an interval of five years of freedom from recurrence. Early recurrence can be accounted for by the failure to completely remove all cancerous tissue in the primary operation. It is not so easy to account for the late recurrences. We may say that the cancerous foci have remained latent in the tissues throughout the intervening years, but such an assumption is scarcely tenable. That these late recurrences may be independent primary growths no one can deny.

The great liability of recurrence in carcinoma of the uterus admonishes us to always give a guarded prognosis, no matter how early and thoroughly the operation may have been performed.

The general symptoms indicating a recurrence are loss of flesh and strength, cachexia, foul-smelling leucorrhea, irregular hemorrhages, and pain in the pelvis radiating to the thighs, groin, rectum, back, and abdomen. A positive diagnosis can only be made from a physical examination. Local recurrence in the tissues about the uterus is recognized by the cartilaginous consistency of the areas of infiltration in the vagina and broad ligaments.

Granulation tissue in the scars at the ends of the stumps previously anchored in the vault of the vagina may be regarded with suspicion. They are seldom so hard and friable as carcinoma, and a microscopic examination of an excised piece or scraping will determine the diagnosis. It is not always possible to say of enlarged glands that they are so from carcinomatous involvement. It is possible that their enlargement is the result of infection.

Treatment.—Cancer of the uterus, in its inception and while yet amenable to successful treatment, is a local disease and demands typical treatment.

The lesion does not long remain confined to the uterus, and hence it follows that radical removal of the growth is only possible in the early stages of the disease.

When surrounding and remote structures are invaded by the spread of the disease through lymph and blood channels, and by continuity of tissue, there can be no permanent cure. It is a lamentable fact that fully 80 per cent. of all cases, when first seen and recognized, are either inoperable or suffer recurrence after operation through unrecognized invasion of neighboring or remote structures.

The great need is not for more extended operative measures, for it would appear that in the radical abdominal operation the limit has been reached, but there is need for earlier recognition of cancerous growths of the uterus.

While the disease is still confined to the uterus the operative procedures at our command afford results which are gratifying.

Few would die from cancer of the uterus if the disease were recognized in time and surgery early invoked.

The greatest obstacle to the early recognition of cancer of the uterus is the misconception that is entertained by the laity, and by some of the profession, that the menopause is normally marked by the occurrence of irregular menstrual hemorrhages and leucorrheal discharges. It should be known by all physicians, and the information should be imparted to their female patients who are in the midperiod of life, that the menopause is marked by a gradual diminution of the menses and by an increasing interval between the menstrual periods; that every increase in the menstrual flow, however slight; that the occurrence of a stain of blood in the intermenstrual period; that all leucorrheal discharges, especially when profuse, watery and acrid, are suggestive of malignancy and necessitate an immediate searching examination. "Women should be advised to submit to an examination from time to time while passing through the cancer period of life, just as one goes to the dentist for inspection of the teeth. This is a precautionary measure of the highest importance, and were it generally adopted fewer cases would escape early recognition and permanent relief." (Winter.)

When recognized at a time when there is no evidence of its extension beyond the uterus there is but one course to pursue, that of *immediate surgical interference.* To resort to such conservative measures as trypsin, amylopsin, acetone, the *x*-rays, or radium is homicide. Such measures are only to be adopted when surgery has failed because of the inoperable character of the growth or because of its recurrence after operation. Even then no more can be accomplished by the employment of these remedies than the checking of the progress of the disease for a time, the relief from some of the disagreeable symptoms, and the giving of encouragement to the patient.

How can we lessen the mortality of cancer of the uterus? Montgomery says that if we accept the theory, that continued irritation favors the development of malignant disease, then in order to prevent its occurrence or limit its frequency the physician must institute measures to avoid irritation and chronic inflammation of the pelvic organs. Injuries to the cervix and pelvic floor must be repaired. Sources of irritation, such as displacements, peri-uterine inflammation, and uterine myomata, particularly of the submucous and interstitial varieties, are sources of irritation and must be eradicated.

Operability of Cancer of the Uterus.—Only in the far-advanced cases can it be said that the case is not operable. This is true because it is known that cancer of the uterus may remain localized for a surprisingly long time; that in such cases a radical operation may effect a cure when least expected, or at least stay the progress of the disease for many years.

On the other hand, it has been noted that at an early time, when the growth is limited in its extent, the parametrium and lymph nodes of the pelvis may be invaded.

Such is the uncertainty of judging the operability of cancer of the uterus, and the more so of cancer of the cervix. It is an established fact that invasion of structures lying beyond the confines of the uterus occurs earlier in the young than in the old.

It is encouraging that year by year the percentage of operable cases is increasing, due to the earlier recognition of cancer and the more extended operations now in vogue.

Percentage of Operability of Cancer of the Uterus.—We find great variation in the percentage of operable cases of cancer of the uterus. The percentage ranges from 5 to 92, and averages about 65.

In 2765 radical abdominal operations for cancer of the uterus by European and American surgeons the average primary mortality was 19.45 per cent. This primary mortality is being gradually lowered. Death in the majority of cases is due to sepsis and not to shock. The presence of pyogenic germs in the cancer tissue is largely accountable for the infection. Five European clinicians show an average of 40.72 per cent. of ultimate cures. In these cases the cancer had not recurred within five years of the operation. In contrast with these statistics American operators show but 8.39 per cent. of cures five years after operation, with only 1 per cent. of "absolute cures."

Operative Treatment of Cancer of the Cervix.—Simple Vaginal Hysterectomy.—Simple vaginal hysterectomy for cancer of the cervix is no longer regarded with favor, for the reason that the parametrium cannot be widely excised. The operation does, however, present a relatively low mortality, and in the hands of the inexperienced operator will afford the best results. There are cases in which, for reason of the difficulties involved in an abdominal hysterectomy, the vaginal route is preferred. We know from our studies of the parametrium and pelvic lymph nodes, in cases of cancer of the uterus, that the extent of involvement of the cervix is no criterion of the presence or absence of cancerous invasion of the pelvic lymph nodes and parametrium, hence the inadvisability of choosing the restricted operation of vaginal hysterectomy in early cases, in preference to the more radical abdominal operations.

When the patient is too weak to withstand an abdominal operation, or when the abdominal wall is very thick, the vaginal route may well be chosen. (See p. 681.)

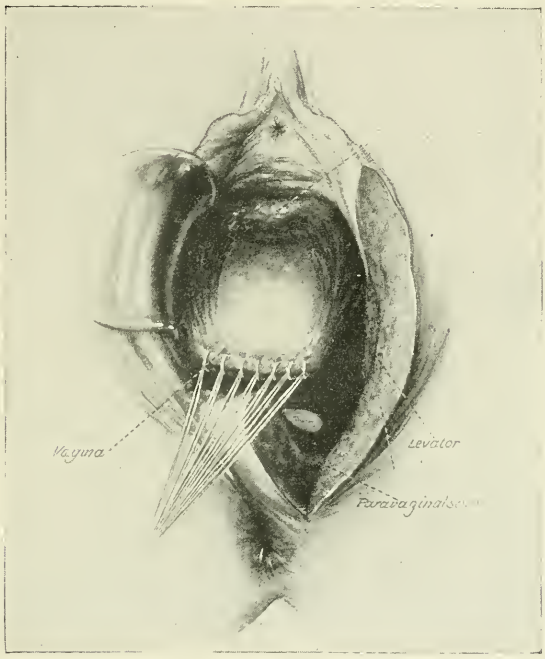
The Byrne Method of Treatment of Cancer of the Cervix.—Before passing to the discussion of the radical abdominal operations for cancer of the cervix, reference will be made to the Byrne method of treatment, which is not only of historical interest, but still reflects many valuable suggestions worthy of serious consideration. Byrne, of Brooklyn, employed the galvanocautery in the treatment of cancer of the cervix. His work was done from 1872 to 1902.

In 367 operations for cancer of the uterus he had no operative mortality. As to the recurrences following his operation Byrne states that he has never known an instance of relapse in which the disease has returned to the part from which it had originally been excised. He repeatedly observed the reappearance in the fundus, ovaries, and some of the adjacent tissues, but he has never known a single instance in which the disease has reappeared in or very close to the cauterized surface from which the cervix had been removed by galvanocautery.

Contrast these results with those of Winter, who in 54 cases out of a total of 58, observed recurrences at the site of excision. From this we conclude that the influence of the cautery extends deep into the tissues, unlike that of the knife and scissors.

Of Byrne's 367 cases the subsequent history was known in 216 cases, of which 93 (43 per cent.) remained free from recurrences for two or more years and 22 (19 per cent.) for five and more years. One case is now living and free of recurrence after twenty-one years.

FIG. 435



Schuchardt operation: Several bullet forceps are placed equidistant around the introitus. A circular incision is made through the vaginal wall immediately above the insertion of the forceps and several centimeters of vaginal wall are dissected off in an upward direction. This cuff is closed with silk sutures, in leaving the sutures long for purposes of traction. The bullet forceps are removed. The cancerous area, which had been previously excochleated and cauterized, is now shut off from the field of operation. (Schauta.)

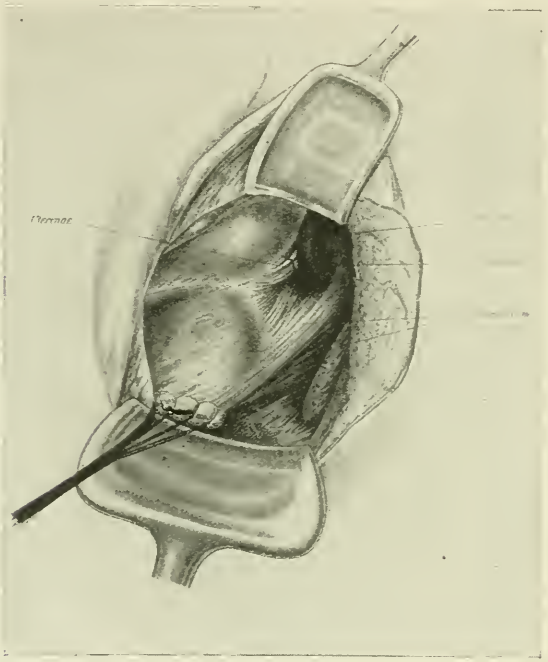
Two features in these reports are particularly noteworthy: (1) The absence of operative mortality, and (2) the absence of recurrence at the point of cauterization. While somewhat better results are claimed for the late radical abdominal operations, no operation has yet approached the Byrne method in these two particulars.

Werder has extended the original Byrne method. He has extended it from a high amputation of the cervix to vaginal hysterectomy, and is thereby able to exclude the recurrences in the body of the uterus

and appendages. He first amputates the cervix with the cautery knife, then removes the body of the uterus and adnexæ with the electrothermic clamp of Downes.

Schuchardt Operation (Extended Vaginal Operation).—The abdominal operation for cancer of the uterus was being extended about the time (1893) that Schuchardt extended the vaginal operation.

FIG. 436



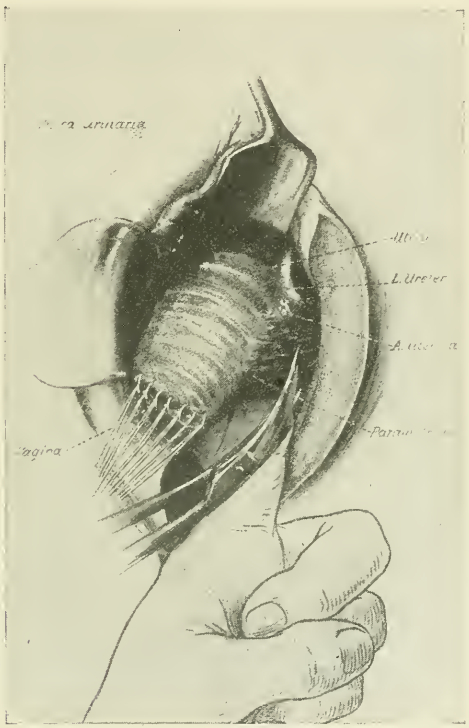
Schuchardt operation: The dissection of the vaginal walls is carried upward to the vesicovaginal fold and the bladder stripped away. If the base of the bladder is widely infiltrated the operation should not proceed further. A small area of infiltration in the base of the bladder may be excised and the opening immediately sutured. The Schuchardt incision is now made. It starts from the left and posterior vaginal walls, extends laterally to the lower end of the labium minus, then turns downward parallel to the rectum, where it turns inward to encircle the left circumference of the anus and terminates in the median line behind the anus. The incision is made to sever the following structures: paravaginal and pararectal tissues, levator ani and coccygeal muscles, cellular tissues of the ischiorectal fossa, skin of the perineum and lateral anal region down to the sacrum. Care should be exercised to avoid injury to the rectum and sphincter ani. This incision freely exposes the parametria, within easy reach. The uterine artery and veins are ligated. The ureter is now in full view and is held aside by a retractor. (Schauta.)

It is now generally conceded that it is impracticable to attempt to remove the lymph nodes of the pelvis, hence the maximum of endeavor is to remove as far as possible the parametrium. If this can be done as effectually by the vaginal route as by the abdominal, the choice would be in favor of the vaginal operation, because of the lower immediate mortality. And Schauta claims that the parametrium and vaginal

walls can be removed as freely by the vaginal operation as by the abdominal.

Out of a total of 564 cases of cancer of the uterus which presented in the clinic of Schauta from 1901 to 1907, 258 were operated per vaginam by the method of Schuchardt, a percentage of 48.7 as compared with 14.7 (Waldstein) of cases operated by the method of simple vaginal hysterectomy. In the extended vaginal hysterectomy, cases are regarded as operable when the vaginal walls and parametrium adjacent

Fig. 437

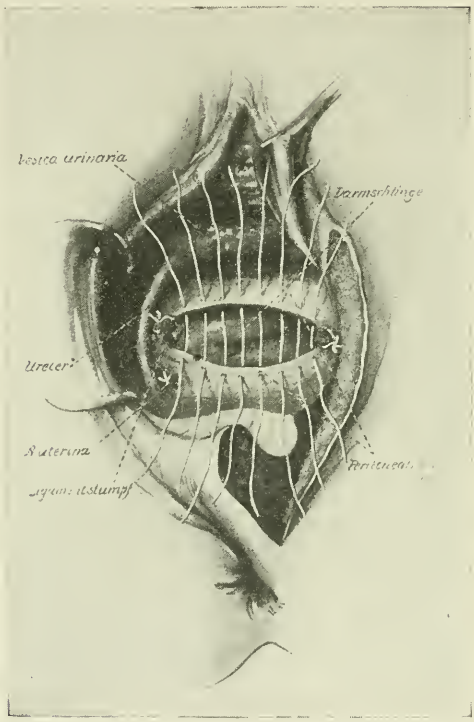


Schuchardt operation: The cul-de-sac of Douglas is opened and the parametria is excised close to the pelvic wall Bleeding can be controlled by ligatures and gauze compresses. (Schauta.)

to the cervix are infiltrated, while in simple vaginal hysterectomy, cases are regarded as inoperable when the cancer has infiltrated beyond the limits of the uterus. No attempt is made to perform the extended vaginal operation when the cancerous infiltration has extended to the sides of the pelvis, but there is no limit to the invasion of the vaginal walls. Schauta has performed the operation in the presence of a cancerous involvement of the entire vagina and of part of the vulva. A cystoscopic examination is made to determine the possible involvement of the bladder before deciding upon an operation, and if found invaded

the operation is not attempted. Of the 258 cases operated by Schauta there were 69 without invasion of the parametrium and 179 in which one or both broad ligaments were infiltrated. The mortality in Schauta's cases remains at 10.3 per cent. in the extended vaginal operation, which is the same record made by Schauta in the simple vaginal operation; but it must be borne in mind that in the extended vaginal operation a large number of cases are operated upon which would have been excluded in considering the simple vaginal operation.

Fig. 438



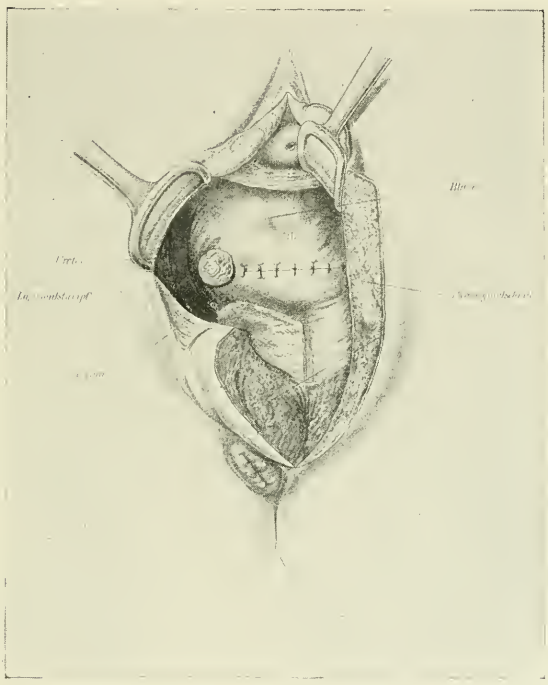
Schuchardt operation: The uterus is now removed and interrupted sutures of catgut are placed in the peritoneal fold. The stumps of the appendages and ligaments are brought down and anchored in the lateral angles of the peritoneal folds. (Schauta.)

As to the percentage of recurrences prior to the end of the second, third, fourth, and fifth years following operation we find 47.2, 43.7, 44.0, and 38.2 respectively.

The Schuchardt operation will never be practised extensively because of the great skill demanded in its proper performance, the high primary mortality attending the operation, and the large percentage of serious complications and sequelæ which result from it.

Radical Abdominal Hysterectomy.—The one subject of paramount interest to the gynecologist is the radical abdominal operation for cancer of the uterus. Not only the uterus and its adnexæ are removed, but the effort is made to remove as far as possible the pelvic tissues involved in the extension of the growth, that is, the pelvic lymph nodes, parametrium, upper segment of the vagina, and broad ligaments.

Fig. 439



Schuchardt operation: The cavity beneath the peritoneal fold is loosely packed with gauze, and the paravaginal incision is closed with buried and superficial sutures. (Schauta.)

The first attempt to eradicate the disease by an extended abdominal operation was made by Freund in 1878. Since then the Freund operation has been modified in the effort to remove pelvic tissues remote from the primary lesion. With each advance in this direction the operative mortality has been increased and the percentage of recurrence has been lessened. At the present writing it is no longer an open question as to whether the improved remote results justify the high rate of operative mortality. We must, in all fairness, encourage the work of Wertheim, Clark, Sampson, Ries, and others, who are pursuing their investigations, for we recall the words of the late Reeves Jackson, who less than a score of years ago condemned vaginal hysterectomy

for cancer of the cervix as a "murderous operation." We therefore await the ultimate solution of the problem without prejudice.

Vaginal hysterectomy for cancer of the cervix has been largely abandoned because of the high rate of recurrence within a comparatively short time. The profession has come to the almost unanimous conclusion that the route of choice is the abdominal, but there is a great diversity of opinion as to the extent to which the abdominal operation should be carried.

To what extent should the dissection of pelvic tissues be carried?

To arrive at a satisfactory answer to this important question we must consider:

1. The frequency of recurrence in the various pelvic tissues which permit of removal.
2. The operative mortality in the various steps.
3. The percentage of recurrences in operations carried to the various degrees of dissection.

The operative mortality has been unquestionably increased by the effort to remove the pelvic lymph glands. In 31.7 per cent. of 60 cases, operated by Wertheim, the pelvic lymph glands were found to contain cancer cells, hence his practice of removing them as far as possible; yet we have the word of Wertheim, himself, that in every case in which the removed glands were found the seat of metastasis—there was recurrence. Why then, we ask, should such an operation be persisted in when the operative mortality is so much higher than in the less radical operation which stops short of removing the lymph nodes? It is further reassuring to note that Winter and Cullen do not share in the findings of Wertheim. They found but 2 per cent. of their cases with glandular involvement.

The author is forced to take the position of Clark and a host of able operators, that the removal of the lymph glands is not justified in view of the high operative mortality and the high percentage of recurrence in cases in which the removed glands are cancerous.

The enthusiasts for the extended operation must admit the utter impossibility of removing all lymph glands of the pelvis, and hence the unfairness of comparing the radical operation for cancer of the breast with that of cancer of the cervix.

Those glands which can be removed are the sacral glands found on the anterior surface of the sacrum and in the mesorectum, and the iliac glands found in the triangle between the external and internal iliac vessels. But we cannot remove the glands along the course of the aorta and renal vessels.

In 253 cases of cancer of the cervix, histological examinations of the pelvic connective tissue were made by Kermauner, Lameris, Brunet, Pankow, and Kundrat, and cancerous invasion of the parametrium was found in 172 (67.6 per cent.). Both sides of the pelvis were as frequently involved as one side; the left side more often than the right. In but 21 per cent. of Pankow's cases was it possible to recognize the invasion clinically.

The manner of invasion was by continuity of tissue or by metastasis. Brunet observed that the invasion by continuity of tissue occurred in one of several ways: either by passing directly through the uterine wall by way of the uterine ligaments, or by way of the lymph channels of the bloodvessel walls and nerve sheaths. In about one-third of the cases the connective tissue was invaded by metastasis by way of the lymph and blood streams.

In no cases of cancer of the corpus was the connective tissue of the pelvis invaded.

It is observed that the glands are involved relatively late in squamous-cell carcinoma, and in old individuals as compared with the young.

Should the glands alone be removed or should the connecting lymph channels be removed with them?

Histological observations point to the invasion of lymph channels as well as lymph glands; hence if the glands are to be removed the lymph channels must be removed with them. Krömer, Schauta, Schmidler, Lameris, and Kermauner have all observed cancer cells in the neighborhood of lymph nodes. It is at once apparent that the removal of all lymph nodes and lymph channels is an impossibility, hence the futility of the procedure.

Brunet found the paravaginal tissue invaded with cancer cells 33 times in 70 cases, and in two-thirds of these cases the superficial layers of the vagina were free of invasion. This emphasizes the unreliability of judging the extent of the invasion from clinical and macroscopic findings, and it speaks for the advisability of removing at least the upper segment of the vagina in all radical operations for cancer of the cervix.

Metastasis rarely occurs in the tubes and ovaries in cancer of the cervix, but has occasionally been found in cancer of the body of the uterus; hence the advisability of removing the appendages in cancer of the body of the uterus.

The glands on the side of greatest involvement of the parametrium may be free and on the other side the seat of metastatic foci. As yet we are not able to distinguish between the various types of cases as regards metastasis.

Preparation of Patient for Operation.—When the patient is impoverished in blood and exhausted in strength, the radical abdominal operation is attended with great risk to life. In these cases a preliminary curettage and cauterization of the cancerous area, followed by rest in bed, forced feeding, and the administration of tonics, will prepare the patient to withstand the prolonged operation.

Wertheim and Clark advise a preliminary cauterization of the cancerous growth before proceeding with the abdominal operation. All may be done under a single anesthesia, or the cauterization may precede the abdominal operation by several days.

A blood examination should be made to determine the degree of anemia. In so doing a radical operation may be postponed, and thus stay for a time an operation that might otherwise prove fatal.

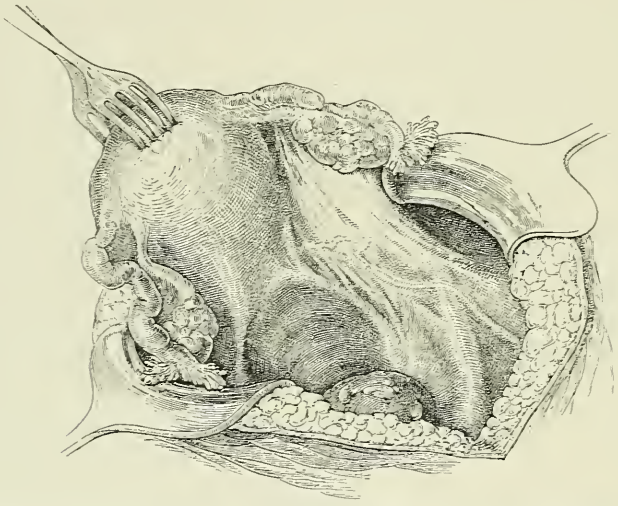
A twenty-four hour specimen of urine should be examined as a guide to the possible occlusion of the ureter.

Technic of the Radical Operation.—As a precautionary measure the ureteral catheter may be passed into each ureter and left there as a guide to the course of the ureters. The danger of injuring the ureters will be greatly lessened thereby. This should be done before the general anesthetic is started.

With added experience the preliminary catheterization of the ureters will be less necessary and may be confined to the cases in which the peri-ureteral tissues are infiltrated.

A liberal abdominal incision is made from the umbilicus to the symphysis pubis. After opening the abdomen, the upper abdominal viscera, especially the liver, should be palpated in view of possibly finding metastasis. It is known that metastatic, cancerous foci may exist in the liver and elsewhere when the primary lesion in the uterus appears operable.

FIG. 440



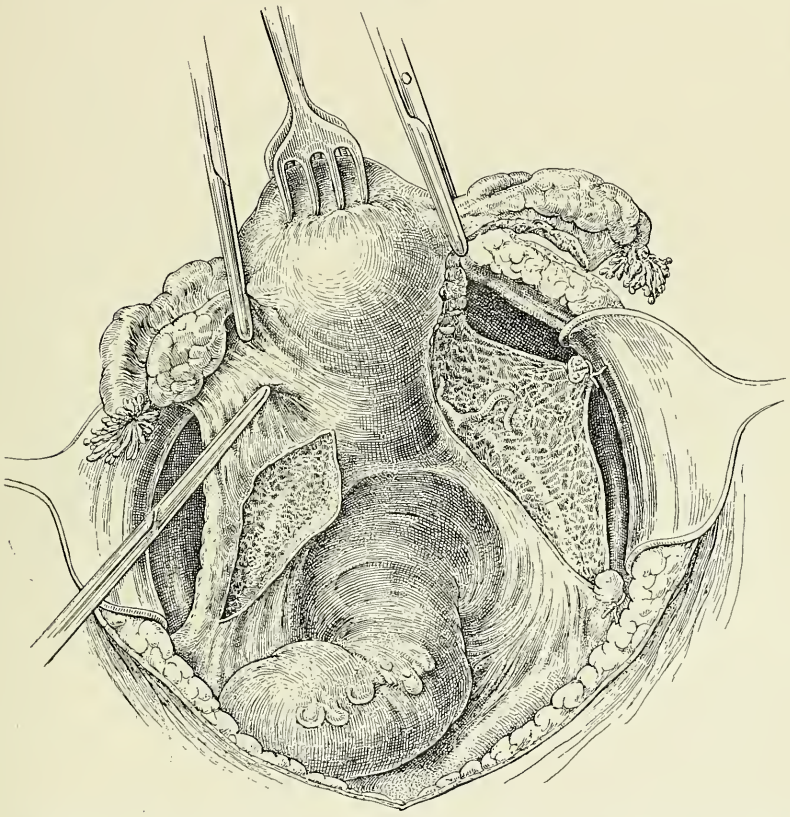
Radical abdominal operation for cancer of the uterus. Step 1. The uterus is grasped by a heavy tenaculum forceps and drawn to one side while being elevated. (After Kelly.)

Having exposed the pelvis to view, a preliminary digital examination should be made with as much haste as is consistent with thoroughness. The broad ligaments are embraced by the index finger and thumb and palpated from the uterus outward to the sides of the pelvis for the purpose of noting areas of induration. Likewise the uterosacral ligaments are palpated and a careful search is made for enlarged glands. If no widespread extension can be discerned in this manner the radical operation may be proceeded with, but if the extension of the growth is beyond the limits of the operation no good can come from such a procedure. It is then advisable to do no more than a simple hyster-

ectomy or to close the abdominal incision without interference and to cauterize the cervix.

If, because of the limited extent of the involvement, it is determined to proceed with the radical operation the work must progress speedily, for at best the operation is long and depressing to the patient. To guard against shock, hot-water bottles are placed about the patient and the

FIG. 441

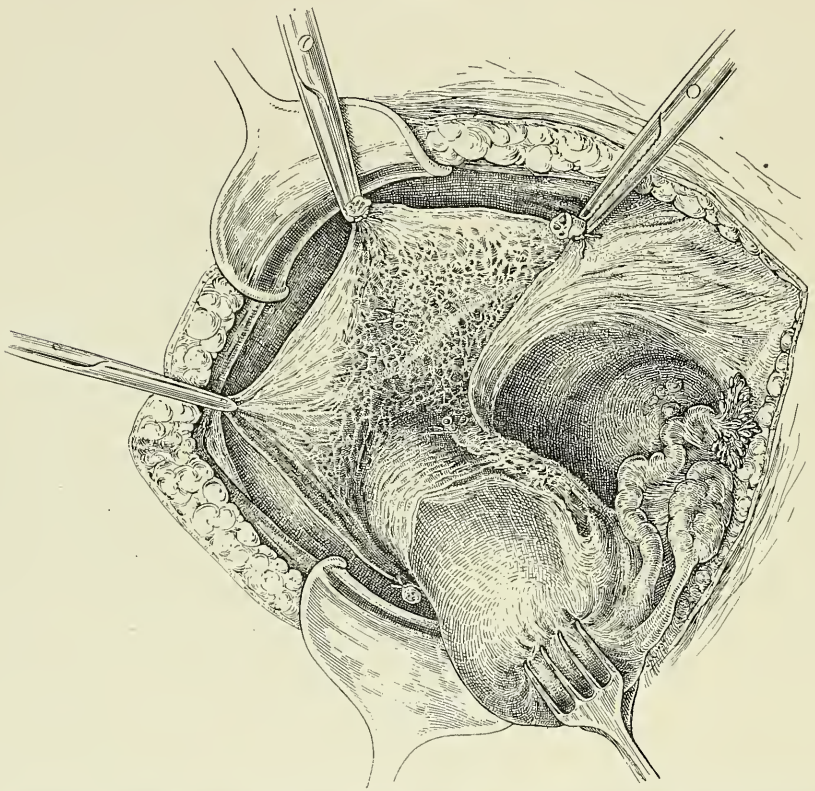


Radical abdominal operation for cancer of the uterus. Step 2. Ligatures are placed about the round ligaments and infundibulopelvic ligaments. The appendages are dissected from the broad ligaments. The broad ligament is split and so dissected as to expose the ureters and uterine arteries. (After Kelly.)

bowels are carefully covered with hot sterile packs. The fundus is grasped by heavy vulsellum forceps and traction is made upward and outward, opposite to the side on which the first incision is made. The initial incision is that suggested by Wertheim, and is made through the peritoneum from the bifurcation of the common iliac artery downward and inward to the point of entrance of the ureters into the bladder (Fig. 441).

Clark next advises to ligate the infundibulopelvic ligaments at the pelvic brim, placing a double ligature and cutting between. The round ligaments are then ligated one inch from their attachment to the uterus and the ligament severed. Having made the two lateral incisions through the peritoneum along the course of the ureters and severed the infundibulopelvic and round ligaments on either side, the next step is to extend the peritoneal incisions around the uterus in front,

Fig. 442



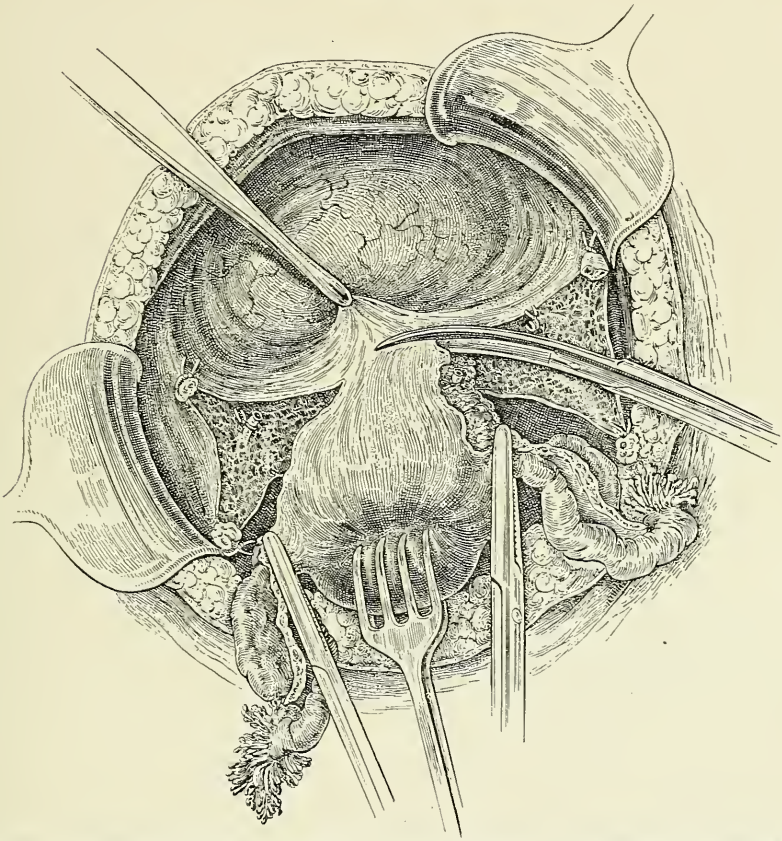
Radical abdominal operation for cancer of the uterus. Step 3. The peritoneum and bladder are stripped from the cervix; the uterine artery is severed between two ligatures and the ureter is pushed far to one side. (After Kelly.)

at a point above the attachment of the bladder. With the uterus retracted backward and upward, the bladder is stripped downward, exposing the cervix and anterior vaginal wall. The ureters should now be carefully located; this is not a difficult task if catheters are in place. They are crowded outward and the uterine arteries ligated and severed on either side. The only remaining supports to the uterus are the vaginal walls and uterosacral ligaments.

The peritoneum back of the cervix is next incised and stripped downward away from the cervix. Next the uterosacral ligaments are ligated and cut close to their attachment to the sacrum.

The right angle clamps used by Wertheim are now made to compress the vaginal walls at a low level. (See Fig. 447.) The vagina is then severed between the clamps by a galvanocautery knife. The denuded surfaces are then charred, taking care to avoid injury to the ureters,

FIG. 443



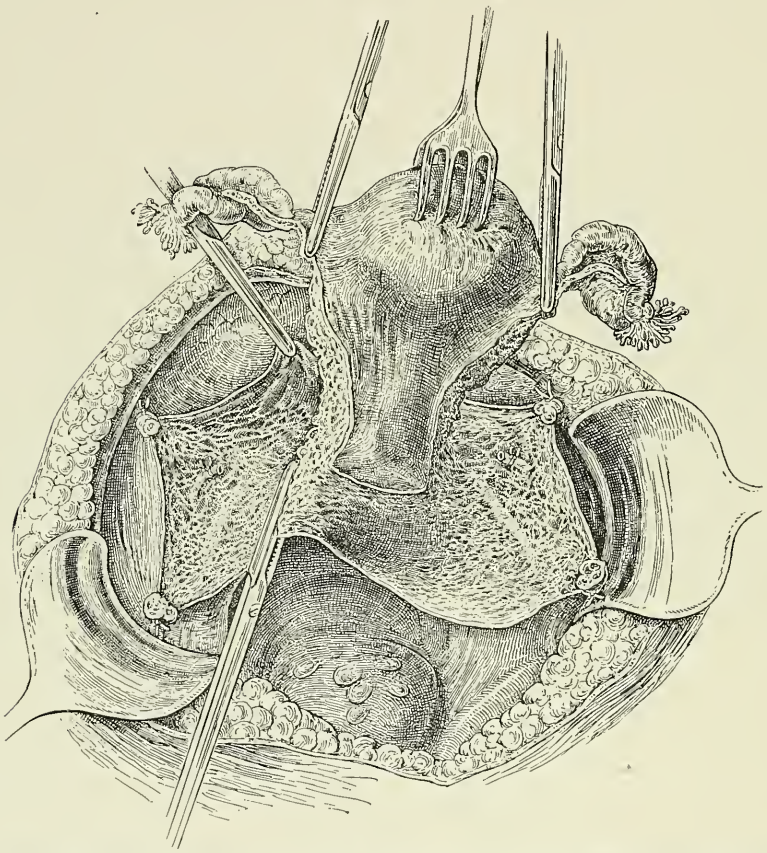
Radical abdominal operation for cancer of the uterus. Step 4. The uterus is brought well forward and upward and the peritoneum incised behind the cervix and stripped downward, exposing the vaginal walls.

bladder, and rectum. The vagina is closed below the clamps with running or interrupted plain catgut sutures. The peritoneal incisions are closed with running sutures of No. 1 plain catgut.

Postoperative Cystitis and Ureteral Fistula.—Cystitis is a common sequel to the radical operation for cancer of the cervix, for the reason that the blood and nerve supply to the bladder are extensively involved in the operation. The diminished blood supply and the loss of tone

of the bladder wall predispose to infection in that retention of urine so commonly results. It has been advised to circumvent the development of cystitis when retention of urine follows this operation by occasionally irrigating the bladder. When cystitis develops, treatment is along the usual lines.

Fig. 444



Radical abdominal operation for cancer of the uterus. Step 5. The peritoneum is stripped from the uterus on all sides, laying bare the supravaginal portion of the cervix, upper segment of the vagina, ureters, and pelvic connective tissue. (After Kelly.)

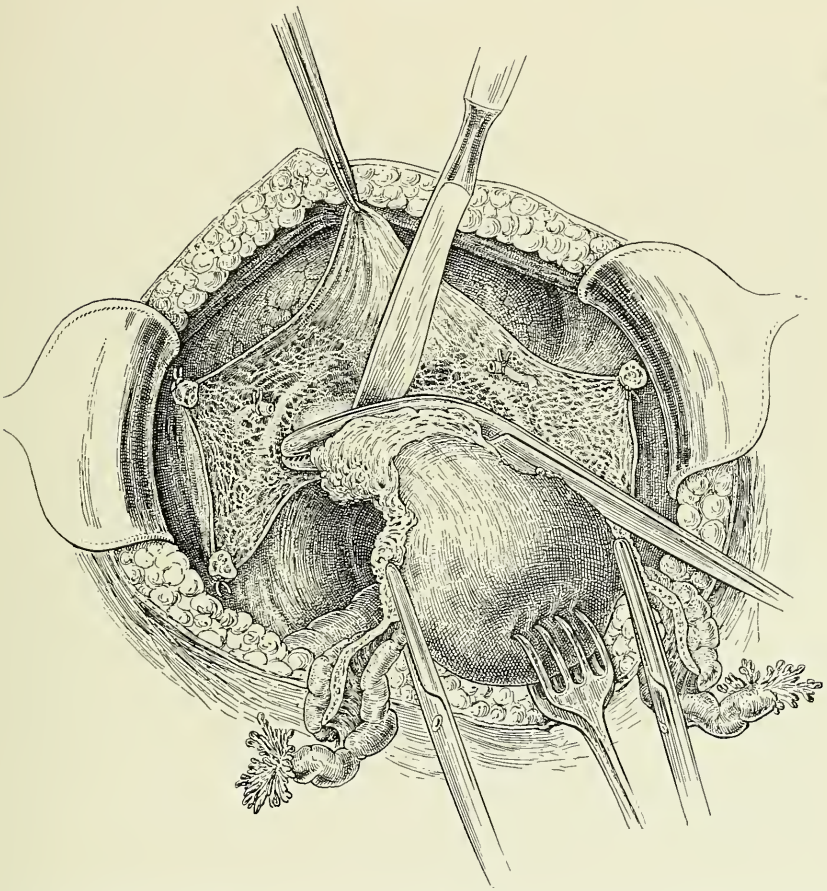
A uretheral fistula may be the result of direct injury to the ureter or to the blood supply to the ureter. The fistula may heal spontaneously or may persist indefinitely, requiring the transplantation of the ureter into the bladder, or in case of infection of the ureter and kidney, a nephrectomy may be demanded.

Kelly speaks of the remarkable fact that there may be few symptoms to mark the accidental ligation of the ureters, that there may be no pain or discomfort, or that the symptoms may be so slight as to be

masked by the ordinary events of the postoperative period. The pain in the kidney may be intense, demanding relief.

In Wertheim's series of 500 cases the primary mortality was excessive. In the first 100 cases the death-rate was 30 per cent.; in the second series of 100 cases it was 22 per cent., and in the last series of

FIG. 445



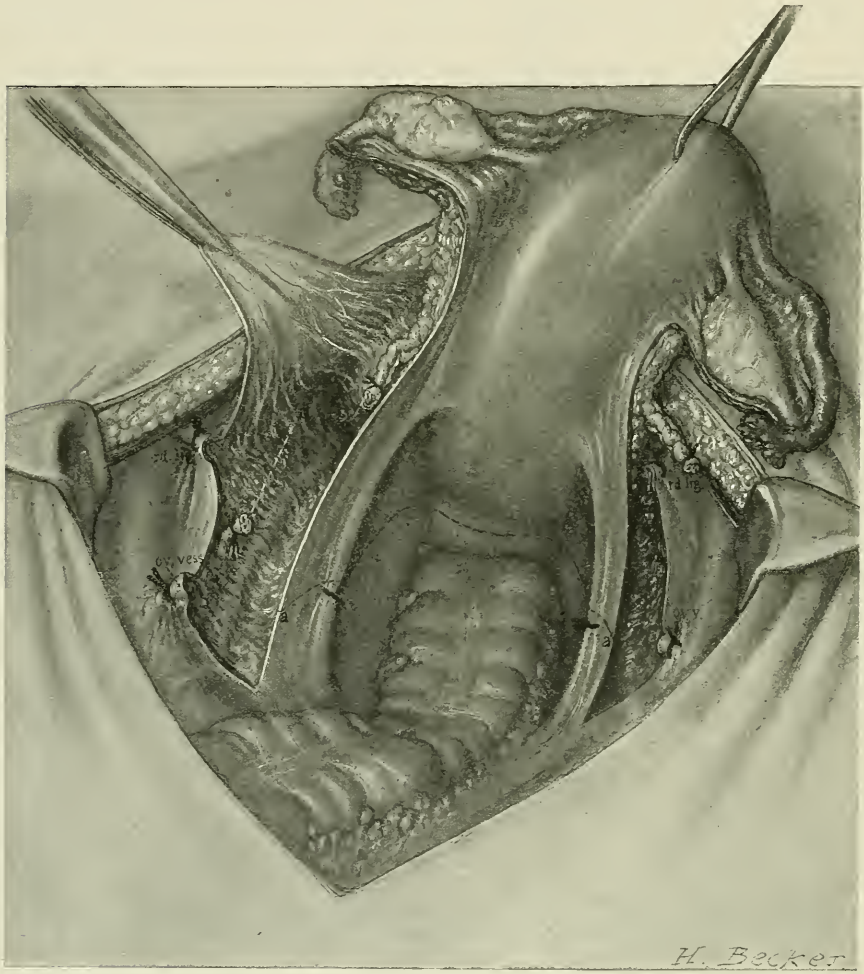
Radical abdominal operation for cancer of the uterus. Step 6. The vaginal walls are clamped below the cervix and severed, and the uterus, together with a portion of the vagina, is then freed completely. In removing the uterus, as much as possible of the connective tissue is removed together with the uterus without doing injury to the ureters. The operation is completed as in total abdominal hysterectomy. (After Kelly.)

100 cases it was 15 per cent. It would not be amiss to contemplate the frightful mortality attending such an operation in less skilful hands.

But it is not alone the primary mortality of this operation that appalls us, for there are many serious complications attending the operation. Clark refers in this connection to the statistics of Rosthorn,

who operated in 256 cases in which the bladder was injured 41 times (16.41 per cent.), the ureters were injured in 6.25 per cent., the rectum was torn in 3 per cent., secondary necrosis of the bladder occurred in 6.25 per cent., and secondary ureteral fistulæ developed in 7.05 per cent. of cases. In addition to these complications and sequelæ, there was a small percentage of intestinal fistulæ and other complications.

Fig. 446

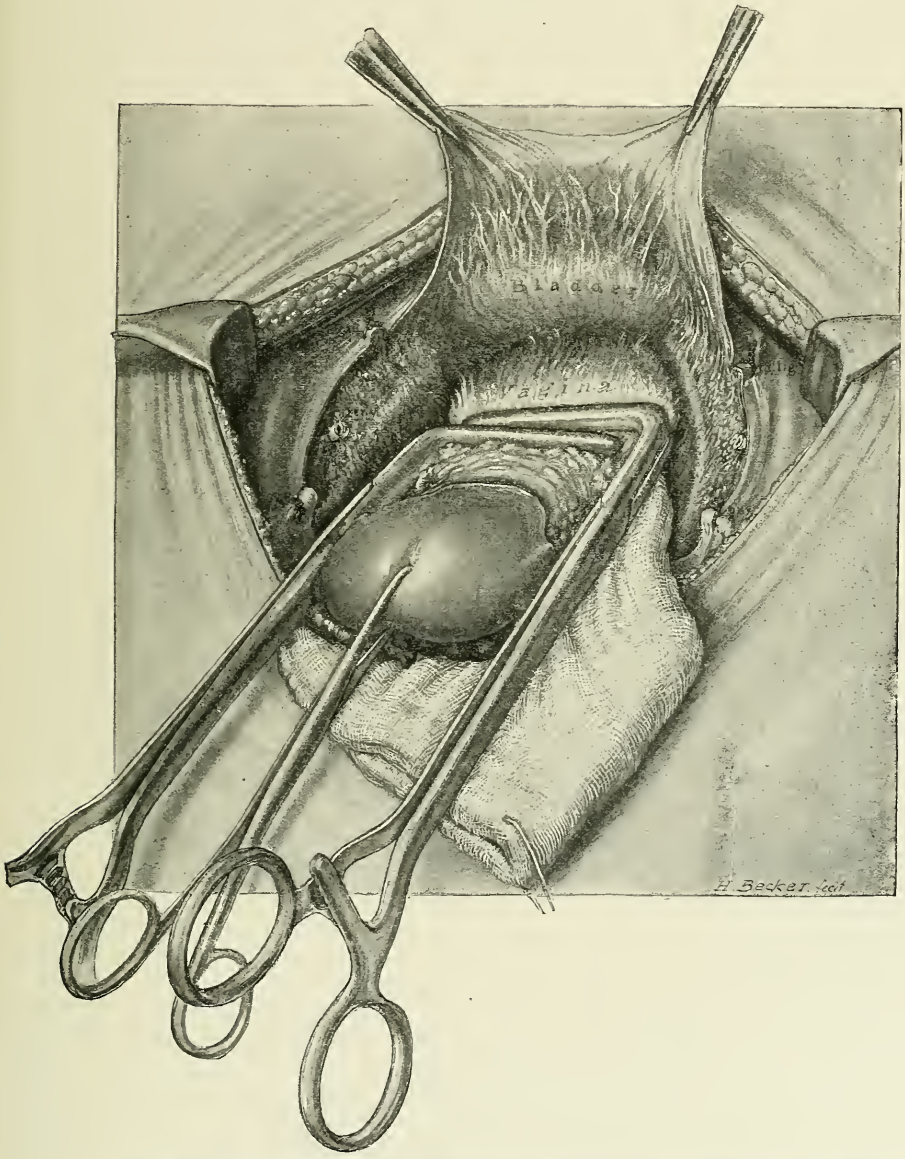


Uterine arteries ligated and cut. Uterosacral ligaments (*a*) ligated. Dotted line in Douglas' cul-de-sac indicates the course of the peritoneal excision. (Kelly-Noble.)

A review of the literature demonstrates the fact that along with the lowering of the percentage of recurrences in cases in which the Wertheim operation has been performed, there has been a corresponding

increase in the primary mortality and in the percentage of serious complications. So true is this that one must seriously consider whether the procedure is really justified.

Fig. 447



Uterus dissected free from the bladder and cut away from its sacral attachment. The uterus is drawn well up toward the umbilicus, while special right-angled clamps are applied, which clear the ureters and securely close the vagina. (Kelly-Noble.)

A review of the statistics on the prognosis of cancer of the uterus reveals a great difference in the results of operators. This fact is largely accounted for by the selection of cases, rather than by the skill of the operator. In the German clinics the statistics are better than in America, because in Germany a larger percentage of cases seek operation in the early stages of the disease.

Primary Mortality following the Extended Abdominal Operation for Cancer of the Cervix.—The combined statistics of twelve German clinics, including a total of 2223 operated cases, show an average primary mortality of 18.86 per cent. In 298 operations performed in America there was a primary mortality of 15.7 per cent. In a total of 23 cases operated by Taussig there was an operative mortality of 8 per cent. in cases not far advanced as contrasted with 72 per cent. in cases that were far advanced.

Percentage of Absolute Cures following the Radical Abdominal Operation.—The combined statistics of six of the German clinics show an average of 17.42 per cent. of absolute cures following the radical abdominal operation.

Taussig, in reporting the results of eight Western surgeons, gives 9.5 per cent. of absolute cures.

Treatment of Cancer of the Cervix Complicating Pregnancy.—1. When the cancer appears operable, no time should be lost in removing the uterus. If the fetus is viable, a Cesarean section should precede hysterectomy. If the child is not viable, hysterectomy should be performed without removing the fetus. To first empty the uterus would subject the patient to an unnecessary loss of blood.

2. When the cancer is inoperable, the life of the child is to be considered and every effort made to continue the pregnancy to term. When this period is reached, the child should be delivered by Cesarean section and the uterus removed if the condition of the patient will permit. As a rule a supravaginal hysterectomy is the operation of choice; this is done to lessen the danger of infection. Delivery through the natural passage gives added danger to the mother because of the liability to rupture of the uterus, serious hemorrhage, and sepsis. If the fetus dies *in utero* the uterus should be amputated above the cervix, and if, in the course of pregnancy, the health of the mother fails rapidly, there is little hope of carrying the child to term. In this event the strength of the mother should be kept up in every possible way, in the hope of being able to deliver a viable child.

Palliative Treatment.—Palliative treatment is demanded when the mother suffers from pain, hemorrhage, and foul discharges. The pain should be relieved by heroine, codeine, small doses of morphine, or rectal suppositories of opium. If the discharges cannot be controlled by antiseptic vaginal douches, preferably of formalin, 1 to 1000, and the hemorrhages are great and uncontrollable, the cervix should be curetted and cauterized. This will probably provoke a miscarriage, but under such circumstances there is little prospect of a viable child. If, however, these conditions arise near the time of labor, the curet and cautery should not be employed until labor is terminated.

Treatment of Inoperable Cancer of the Cervix.—A review of the literature convinces one that much can be done to prolong life and relieve suffering in this unfortunate class of cases. By scraping away all friable tissue and vigorously applying the Paquelin cautery, the bloody and leucorrheal discharges are checked, and if this procedure is repeated when the discharges return, it is possible to prolong life in comparative comfort for months and probably years. In 408 cases reported by Blau there was an average of 252 days of life after the initial curettement and cauterization. Pawlick records the case of a patient who lived twenty-one years after the initial treatment. In the experience of Conrad there was an average of 525 days of life in cases treated with chloride of zinc and pyoktanin. Tomer recorded 119 cases treated by the Paquelin cautery that were apparently healed after five years. These statistics speak for the value of local applications in the management of cancer of the cervix, which is so far advanced as to be no longer operable. We are seriously handicapped in the management of these cases because of our inability to pursue a definite line of treatment for the required time. Our hospitals do not wish to harbor these cases and too often these patients are lost sight of. The need is for hospital accommodations for such cases, in which isolated wards are provided and every facility afforded for their care.

Gellhorn Treatment.—For the past three years the author has followed the suggestion of Dr. George Gellhorn in curetting and applying acetone to the excochleated area.

The method consists in thoroughly scraping away all friable tissue, then elevating the hips of the patient and introducing about one ounce of acetone through a Ferguson speculum. The anesthetic is stopped, and at the end of twenty to thirty minutes, the acetone is decanted by lowering the hips. A long, narrow strip of sterile gauze is soaked in acetone and packed into the excochleated area, and in front of this is inserted a tampon smeared with sterile vaseline.

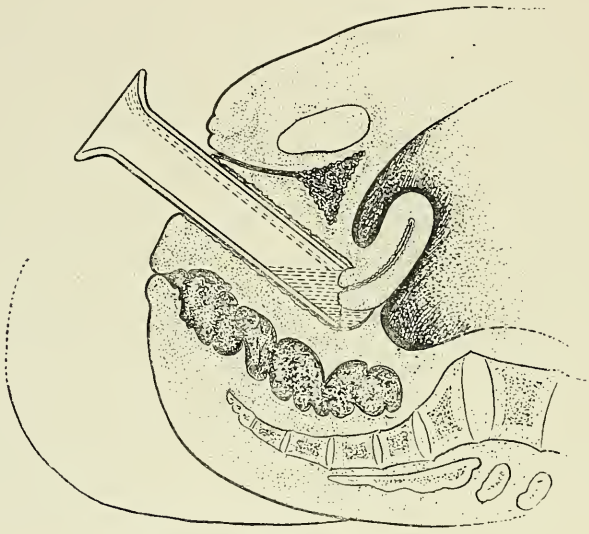
Subsequent treatments are given two or three times a week, and later at longer intervals. No anesthetic is required for these treatments. Great caution must be exercised in preventing the acetone from coming in contact with the vulvar surfaces. These should be smeared heavily with vaseline, the hips elevated, and a Ferguson speculum inserted into the cancerous cavity. The speculum is then partly filled with acetone and the patient directed to hold the speculum in place for twenty to thirty minutes. As the crater diminishes in size, smaller specula are used. In the intervals between treatments, antiseptic vaginal douches are given.

In my experience with the acetone treatment the hemorrhages do not recur, the discharges disappear almost completely, and the crater at the vault of the vagina is greatly constricted. Not infrequently a smooth scar is left in the vault of the vagina. It is not claimed for this treatment that it will relieve pain or stay the progress of the malignant invasion of tissues, but it does prolong life and promotes comfort.

To control the pain the author does not hesitate to give the needed opiates. He is in the habit of beginning with aspirin, 10 grains, or heroine in $\frac{1}{12}$ to $\frac{1}{6}$-grain doses, and when this fails, to begin with morphine in as small doses as will render the patient free of pain.

The strength of the patient must be kept up by nourishing food and the administration of tonics. All manner of means must be employed to interest the patient and to keep her buoyant in spirits. It is a questionable practice to prolong life when the patient is suffering, as they so often do, in the last stages of cancer of the cervix.

Fig. 448



Introduction of the Ferguson speculum.

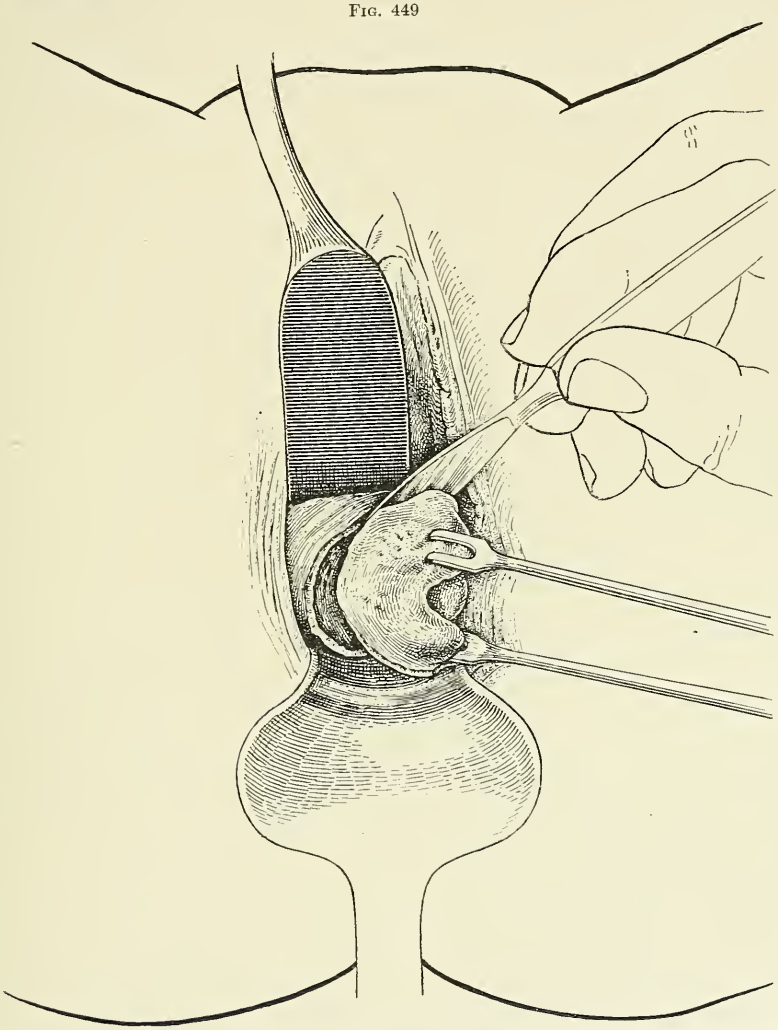
Prognosis.—At the present time cancer causes more deaths in women than does tuberculosis. Clark says: "A careful analysis of the statistics of cancer which are obtainable at the present time forces one to the conclusion that there is a constant and considerable increase in the number of people afflicted with cancer in all civilized countries." The time when a patient who has been operated for cancer of the uterus may be pronounced cured is arbitrarily placed at five years, though it is understood that recurrence may take place at a later date. The difficulty of following the cases in after years accounts for the unsatisfactory statistics in cancer cases.

We have the report of Baldy in support of Cullen, who says that not more than 5 per cent. of cases of cancer of the cervix are cured. In contrast to the discouraging statistics of the above authors we find Leopold claiming 43.2 per cent of cures and Kaltenbach 13.9 per cent.

It is noted that the older the individual, the less the chance of recur-

rence. Pregnancy complicating cancer of the cervix presents a most favorable condition for the extension of cancer because of the great vascularity of the tissues and the active lymph channels. The great need is for an early diagnosis, and when made the necessary operative measures will not be wanting, and the results will be more and more encouraging.

Fig. 449



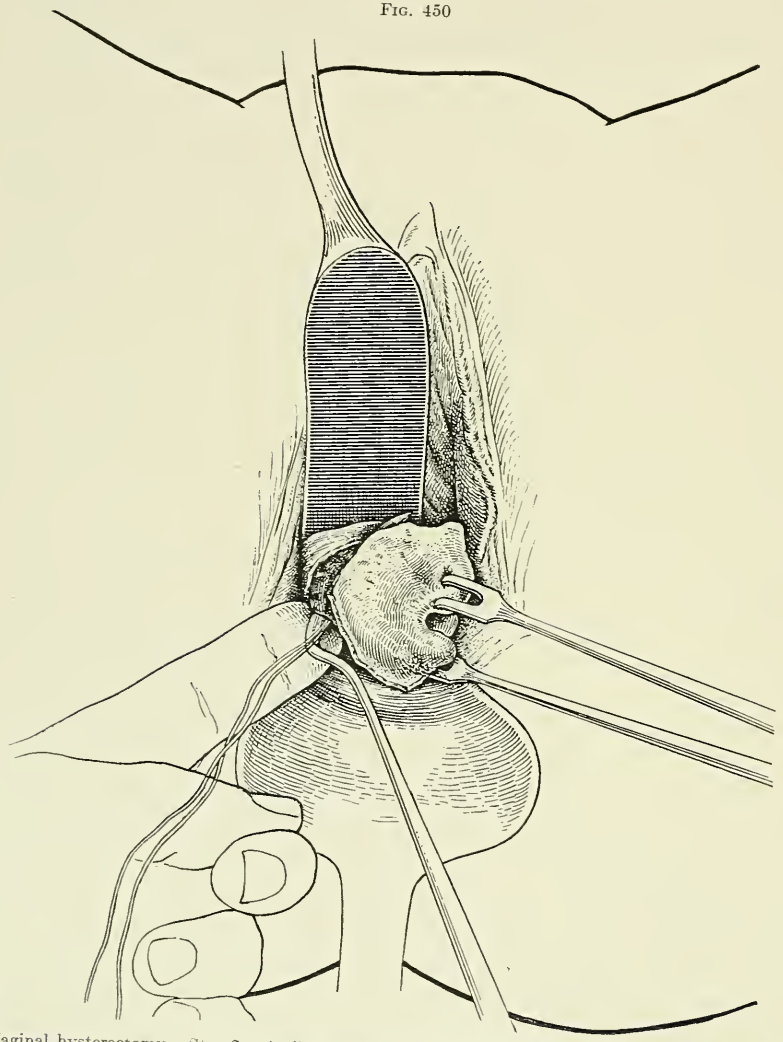
Vaginal hysterectomy. Step 1. A weighted speculum below and a retractor above exposes the cervix. The cervix is grasped by a tenaculum forceps and firm traction is made upon the uterus. A circular incision is made through the vaginal wall about one-half inch back of the external os. The vaginal wall is then stripped back to the peritoneal attachments in front and behind.

Treatment of Cancer of the Body of the Uterus.—It is encouraging to turn from the depressing picture of cancer of the cervix to cancer

of the body of the uterus, with its far greater prospect of cure from surgical interference.

Kelly notes 81 per cent. of recoveries in 16 cases, as compared with 24 per cent. of his 66 cases of cancer of the cervix. Kelly also noted that his percentage of operative mortality is less in cancer of the body of the uterus than in that of the cervix, the ratio being 7 to 16.

FIG. 450

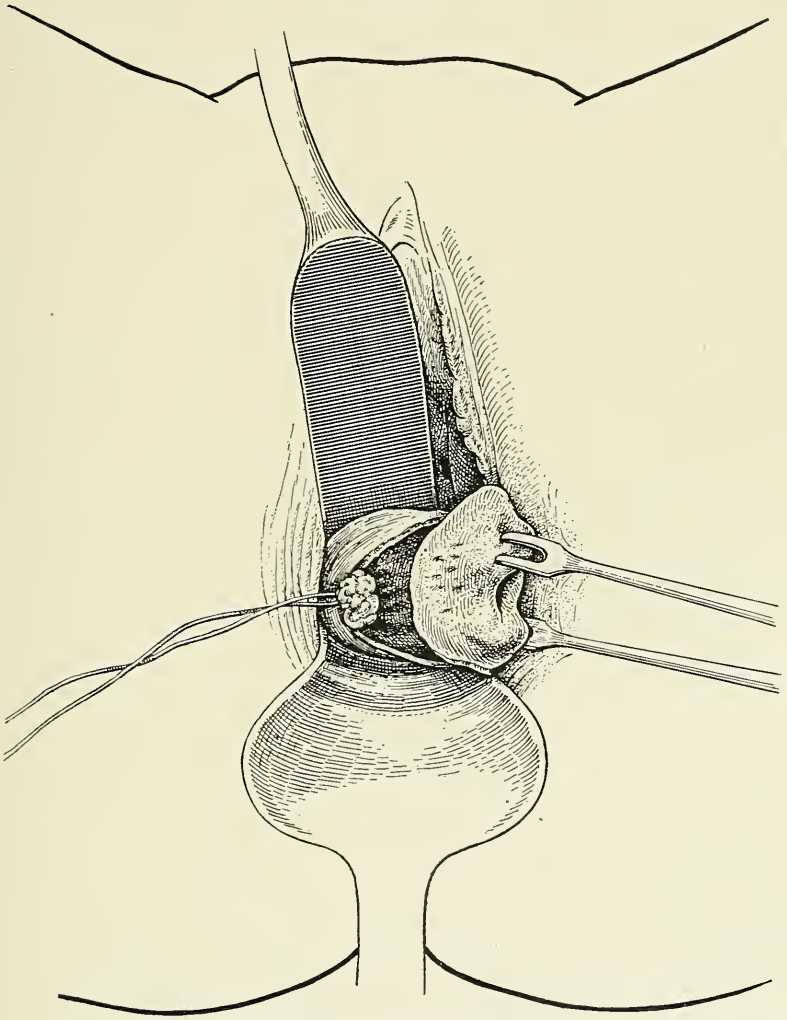


Vaginal hysterectomy. Step 2. A silk, linen, or catgut ligature is passed through the base of the broad ligament on either side of the cervix.

The operative treatment consists in complete hysterectomy, either vaginal or abdominal. The technic does not differ from that of the classical hysterectomy.

Technic of Vaginal Hysterectomy.—With the patient in the lithotomy position and the field of operation prepared in the usual manner, the following steps are taken in removing the uterus per vaginam.

Fig. 451



Vaginal hysterectomy. Step 3. The ligated structures are severed between the ligature and the cervix. The ligatures are not cut.

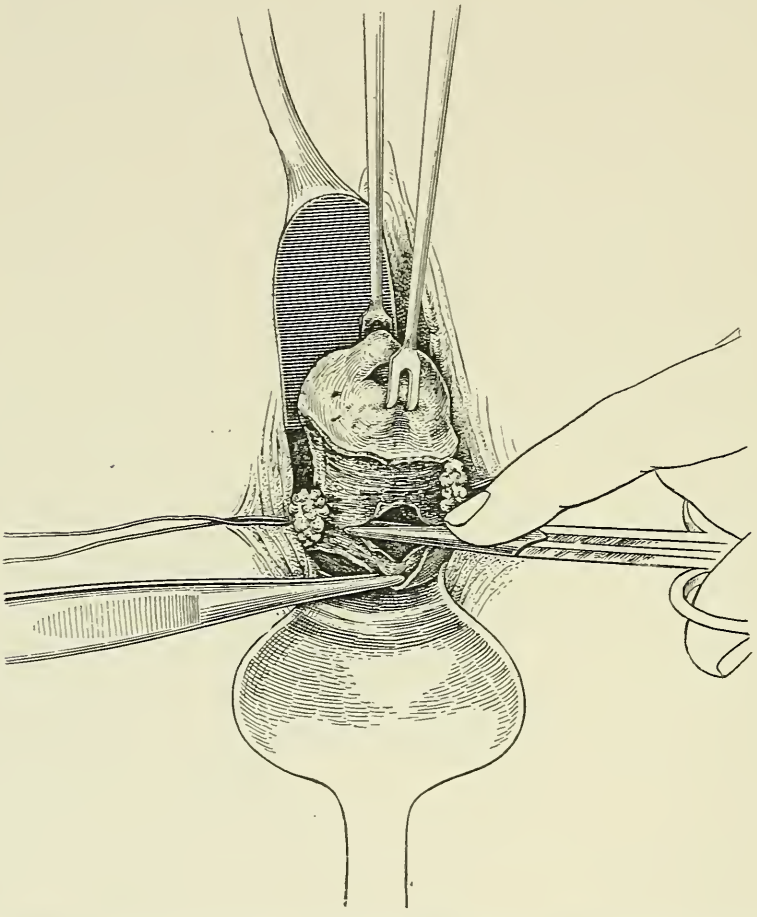
Step 1.—The cervix is exposed by a weighted speculum and two lateral retractors.

Step 2.—A preliminary curettage is followed by swabbing the uterus with tincture of iodine or full strength of formalin.

Step 3.—Both lips of the cervix are grasped with a heavy tenaculum forceps, on which firm traction is made.

Step 4.—A circular incision is made about the cervix three-quarters of an inch above the external os. This incision is made through the vaginal mucosa only.

Fig. 452



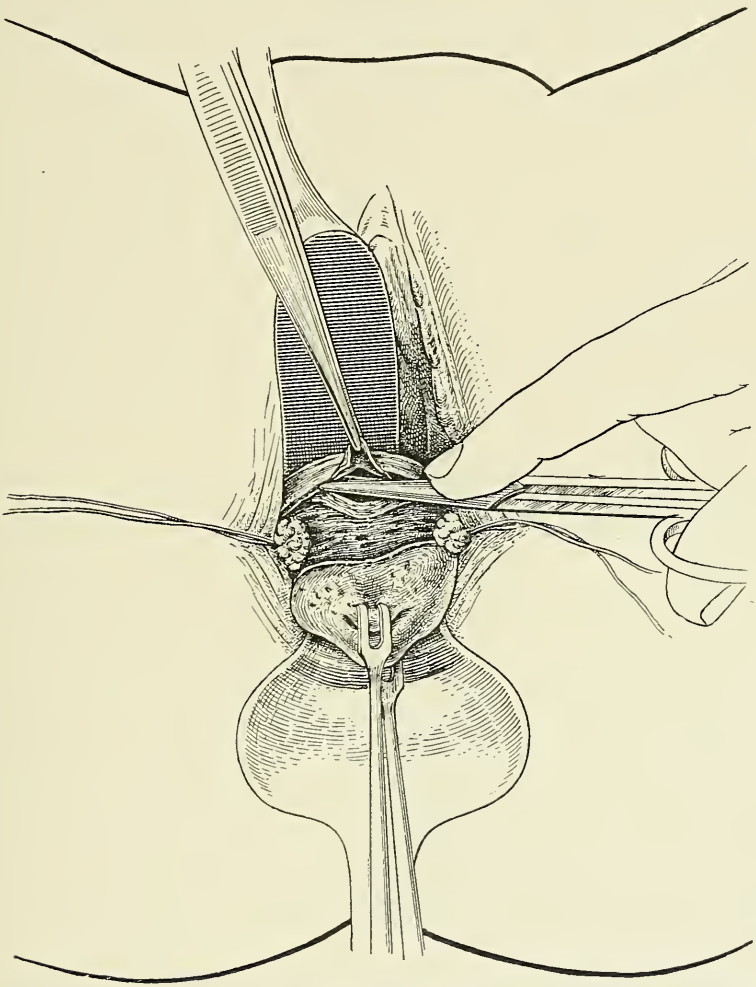
Vaginal hysterectomy. Step 4. The cul-de-sac of Douglas is incised transversely and the peritoneum stitched to the free margin of the vaginal wall with interrupted sutures of catgut.

Step 5.—With a bit of sterile gauze wrapped about the forefinger, the vaginal mucosa is stripped upward from the cervix to a point in front marked by the vesico-uterine fold of peritoneum, behind by the recto-uterine fold of peritoneum, and laterally by the base of the broad ligaments.

Step 6.—Grasping the fold of peritoneum in front of the cervix with tissue forceps, an opening is made into it by scissors and enlarged

laterally by spreading with the fingers. The peritoneum is then stitched to the vaginal wall in front of the cervix by passing four or more interrupted plain catgut sutures at intervals of about one-half inch.

Fig. 453



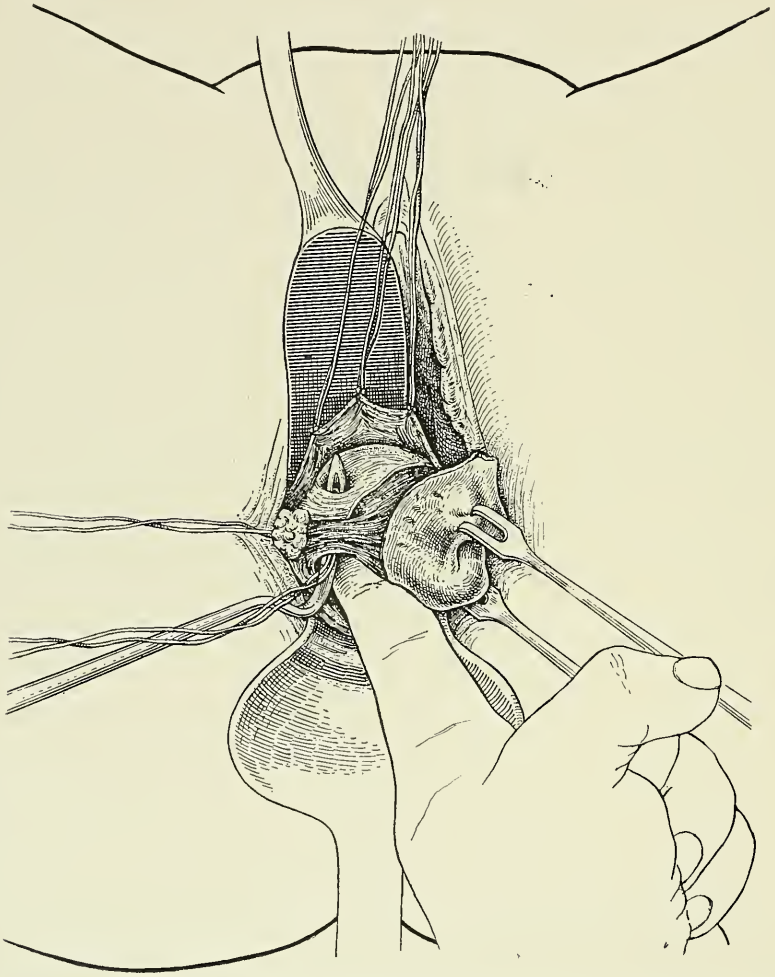
Vaginal hysterectomy. Step 5. The cervix is turned downward and a transverse incision is made through the peritoneal fold between the bladder and uterus. The peritoneum is stitched to the anterior vaginal flap.

Step 7.—A similar process is carried out behind the cervix after pulling the cervix downward and sharply forward.

Step 8.—Ligatures are now passed through the base of the broad ligaments on either side of the uterus. The author prefers to use heavy linen sutures passed by a pedicle needle. The first suture is passed

close to the supravaginal portion of the cervix and should embrace the uterine artery. A second ligature of No. 2 plain catgut may be passed at this point to still further secure the uterine artery. Having tied the ligatures, the ligated tissues are severed with scissors close to the cervix. These and all other ligatures are left long and are grasped by artery forceps.

Fig. 454

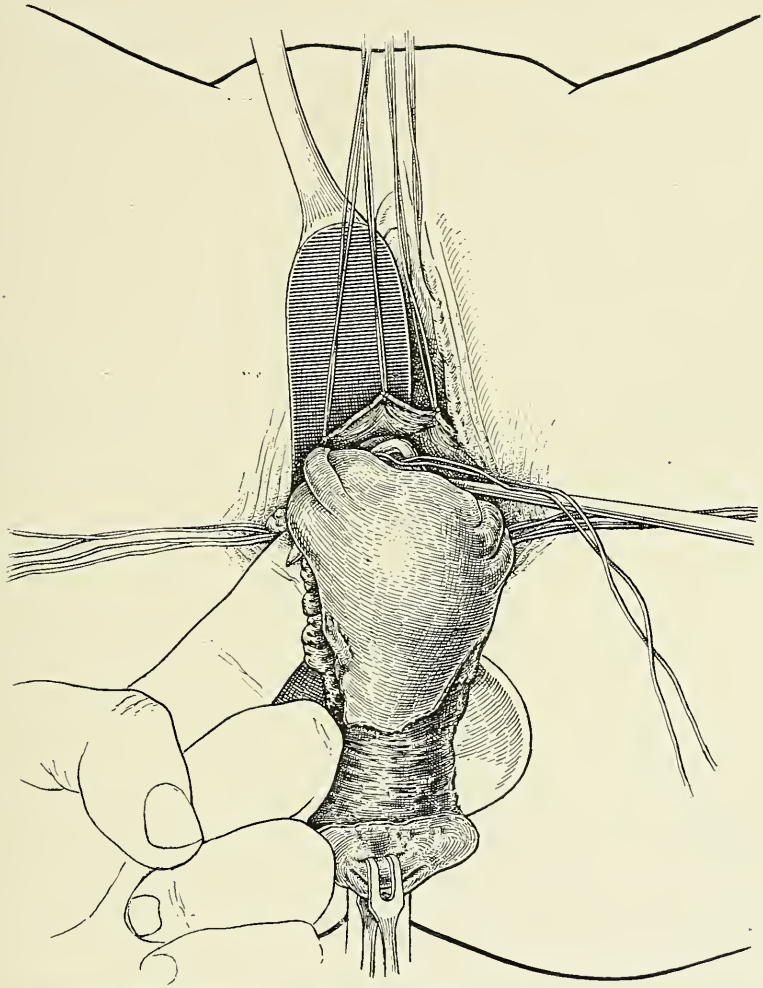


Vaginal hysterectomy. Step 6. Additional ligatures are passed through the broad ligament on either side and the tissues severed between the ligatures and the uterus. Two ligatures should be placed about either uterine artery.

Step 9.—The cervix is then drawn forcibly to the opposite side and similar ligatures are passed about the base of the broad ligament and the ligated structures severed.

Step 10.—Similar ligatures are next passed higher up on the broad ligament, alternating from side to side according to the accessibility of the parts. As the ligatures are tied, the ligated structures are cut

FIG. 455



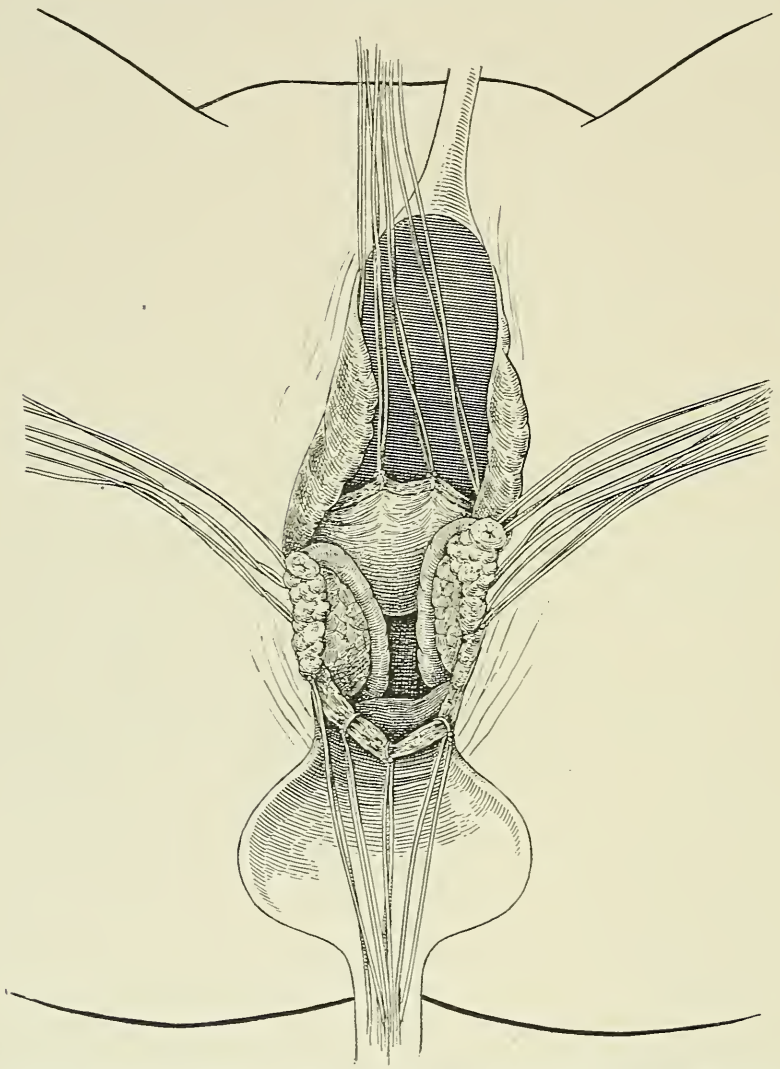
Vaginal hysterectomy. Step 7. Final ligatures are placed about the tubes and ovarian ligaments. These structures are severed from the uterus between the ligatures and the uterus. If desired to remove the appendages, they are drawn out together with the uterus and a ligature is placed about the infundibulopelvic ligament.

from the side of the uterus and the ends of the ligatures secured by artery forceps hanging outside the vagina.

Step 11.—The round ligaments are ligated and severed close to the uterus on either side.

Step 12.—If the tubes and ovaries are to be removed, a ligature is passed about the tubes and ovarian ligaments on either side when they

FIG. 456

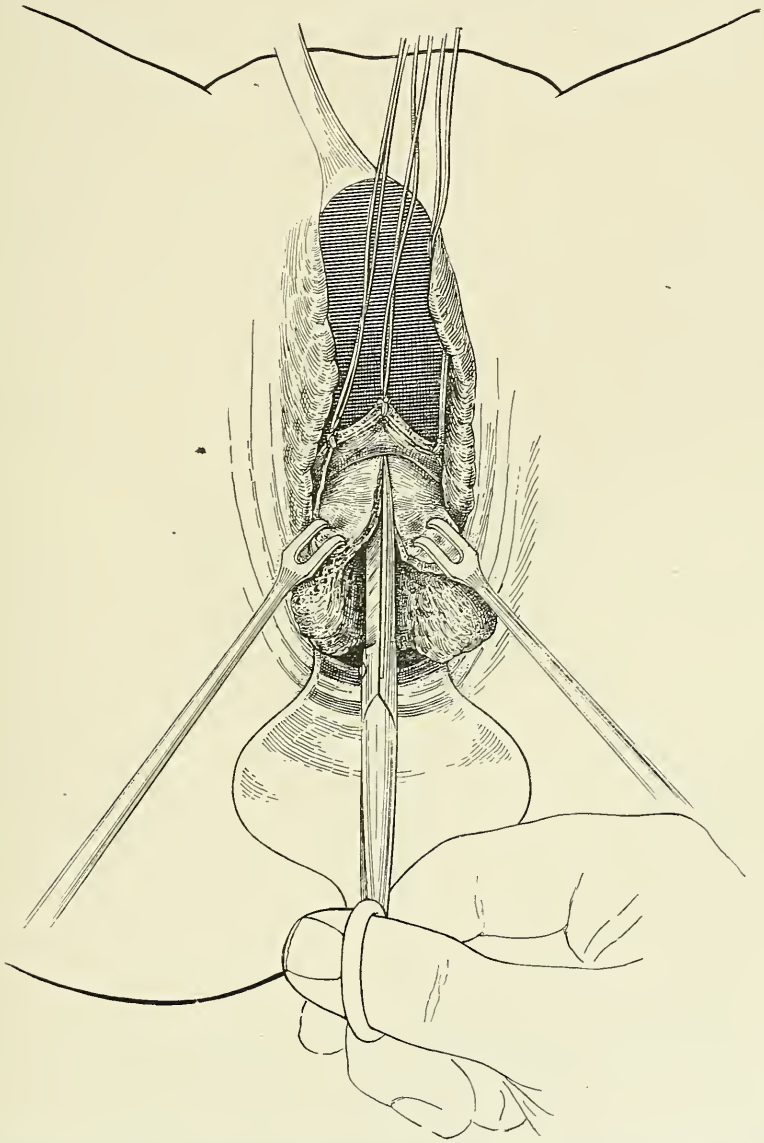


Vaginal hysterectomy. Step 8. The ligatures are all drawn out of the vault of the vagina and are anchored by catgut at either side of the opening. In this manner all ligatures are delivered within the vagina, and the vaginal walls are well supported by the broad ligaments and round ligaments. The opening in the vault of the vagina is then closed with catgut, or if thought advisable, a strip of gauze can be inserted for drainage.

are severed from the uterus. If the tubes and ovaries are to be removed, together with the uterus, the last ligature is passed about the infundibulo-

pelvic ligament and the structures severed between the ligature and the ovary and tube. The uterus is now freed of all attachments and is withdrawn through the vagina.

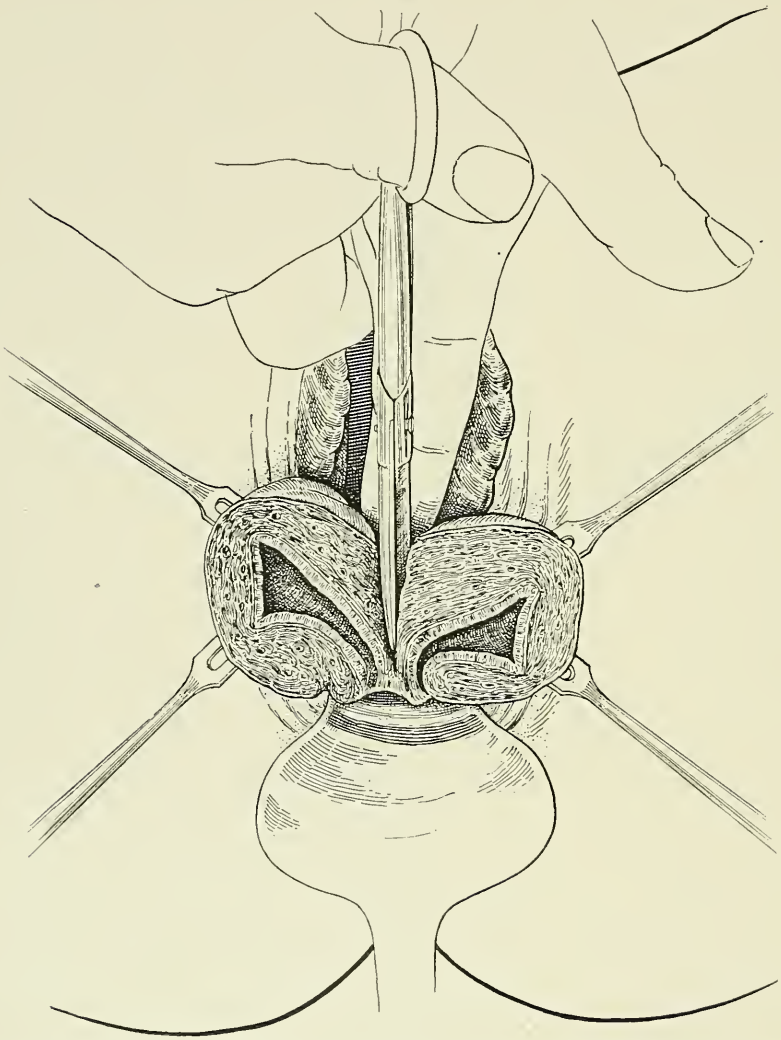
Fig. 457



Bisecting the uterus to facilitate vaginal hysterectomy. Step 1. After stripping the vaginal wall from the cervix and opening into the peritoneal cavity in front and behind, the anterior wall of the cervix and body of the uterus are split with scissors from below upward.

Step 13.—The stumps of the divided ligaments and appendages are now drawn into the vault of the vagina and anchored to the vaginal walls so that all ligatures lie within the vagina. This is done by passing

FIG. 458

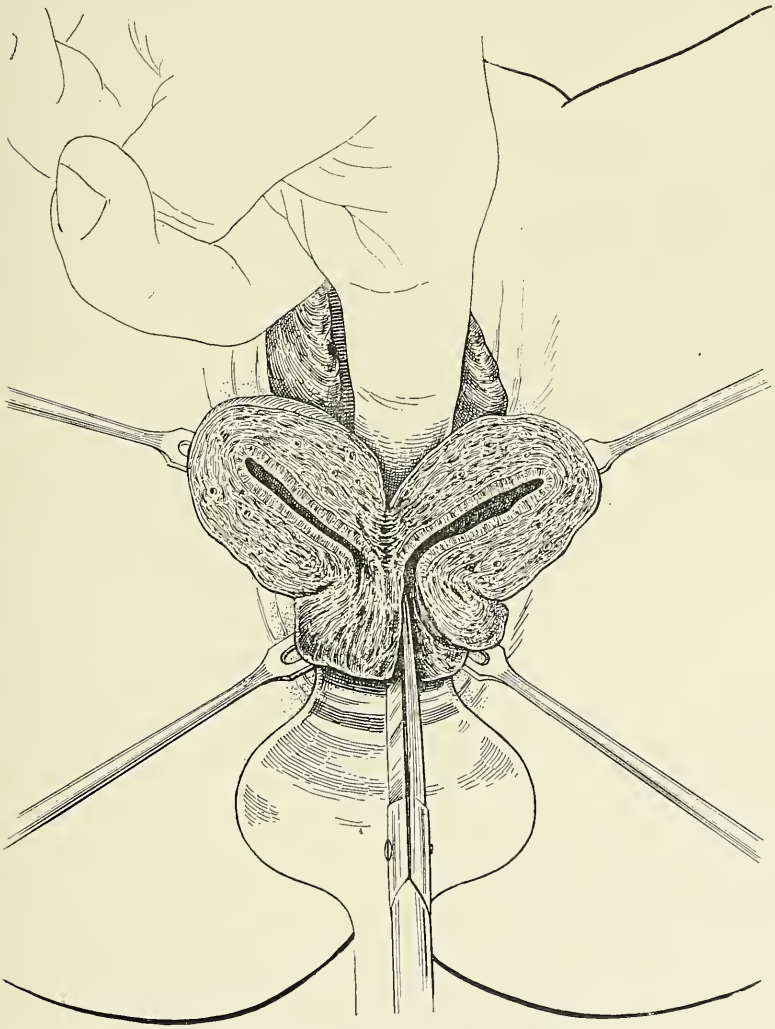


Bisecting the uterus to facilitate vaginal hysterectomy. Step 2. Either horn of the uterus is grasped with a tenaculum and the uterus pulled forward. The index finger of the left hand is inserted back of the uterus as a guide and the posterior wall of the uterus is severed to the internal os.

a No. 2 plain catgut suture on a cutting needle through the anterior vaginal wall, then transfixing the stumps of the corresponding side above the ligatures and passing out through the posterior wall of the vagina. When this suture is tied, the stumps are securely pinioned

to the vault of the vagina. A similar process is carried out on the opposite side. One or more additional sutures are passed through the vaginal walls between the points of exit of the stumps, and in this manner the vault of the vagina is completely closed. The ligatures are then cut close and the vagina is packed with iodoform gauze.

Fig. 459

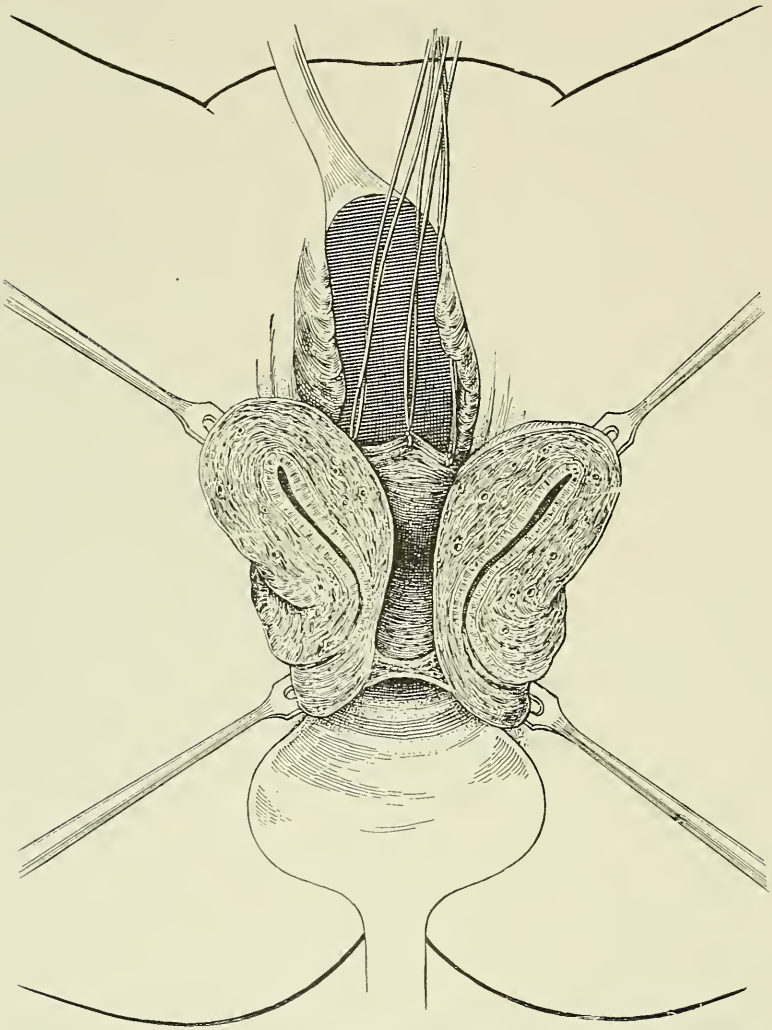


Bisecting the uterus to facilitate vaginal hysterectomy. Step 3. The posterior wall of the cervix is severed in the median line from below upward.

Step 14.—When drainage is required a strip of iodoform gauze may be carried into the pelvis between the anchored stumps. This should be done if there is danger of hemorrhage or infection.

Variations in Technic.—It may become necessary to vary the above technic because of existing complications. If the uterus is large it may be found advisable to bisect the uterus and remove either half separately as illustrated in Figs. 459 to 462. The author's preference

FIG. 460

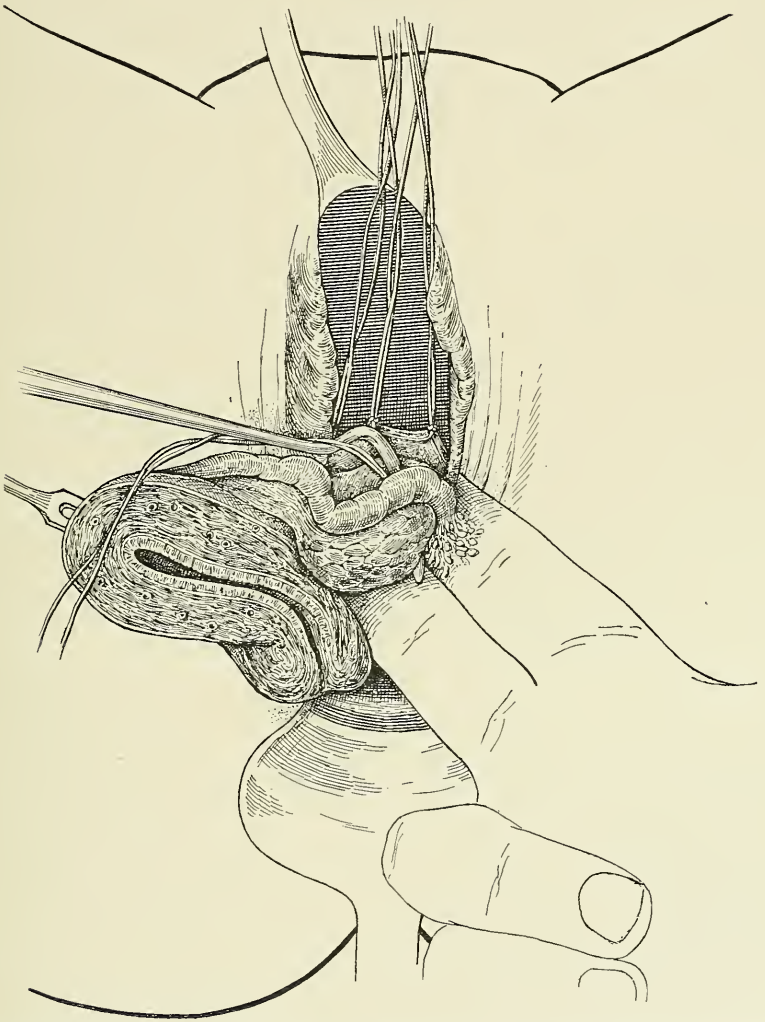


Bisecting the uterus to facilitate vaginal hysterectomy. Step 4. The uterus is completely bisected and traction is made outward upon either half of the uterus.

would be for abdominal hysterectomy in such cases. Again, it may be found easier to deliver the body of the uterus through the anterior incision and ligate the lateral structures from above downward as shown in Figs. 461 and 462.

The operator should not restrict himself to any fixed rule of procedure, but should adapt himself to the conditions as they arise. Occasionally the author has found it necessary to open the abdomen in the

Fig. 461

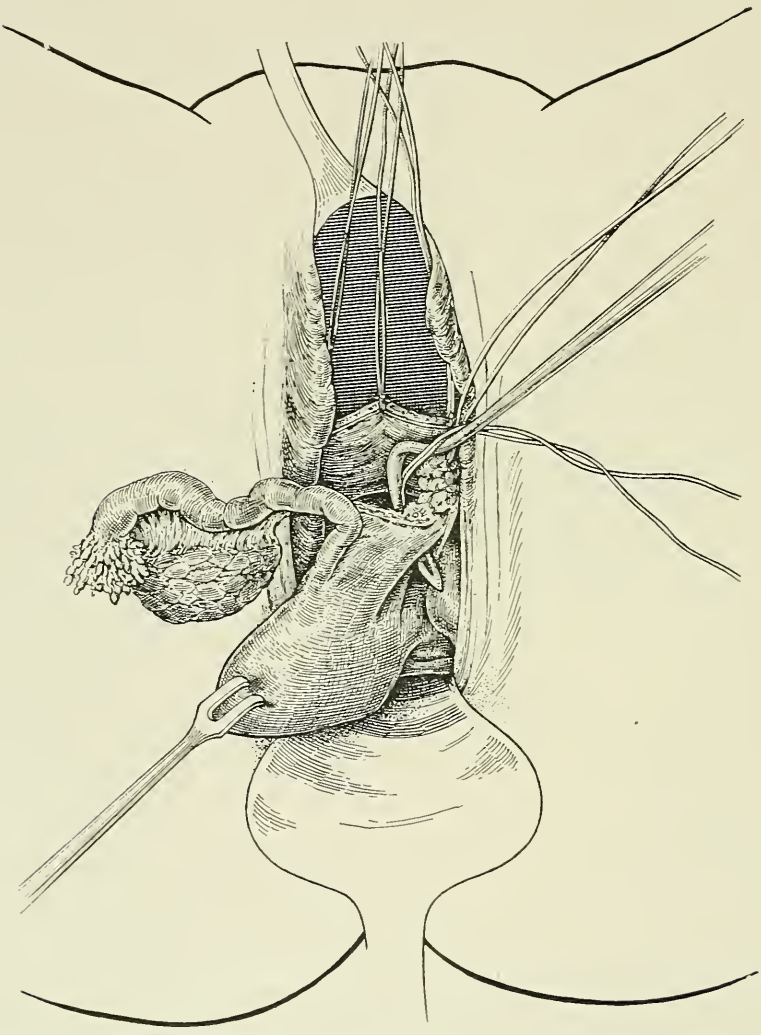


Bisecting the uterus to facilitate vaginal hysterectomy. Step 5. The structures lateral to the uterus are ligated and severed from the uterus from above downward. The appendages may or may not be removed.

course of a vaginal hysterectomy for the purpose of severing the upper attachments which could not be reached from below because of the large size of the uterus and the presence of adhesions and diseased appendages.

After-treatment.—The gauze pack in the vagina is removed at the end of twenty-four hours. Vaginal antiseptic douches are given daily after the fourth day until all discharges have ceased. The patient may be allowed to walk about after the fourteenth day.

Fig. 462



Bisecting the uterus to facilitate vaginal hysterectomy. Step 6. After ligating and severing all attachments to the uterus, the stumps are drawn into the vault of the vagina and anchored to the vaginal walls.

Endothelioma.—By endothelioma is meant a malignant new-formation arising from the endothelium of blood and lymphatic vessels and

from serous surfaces. Endothelioma appears at any time in life. The earliest reported case is that of Braetz, at eighteen years of age.

Such growths differ from carcinoma and sarcoma not only in their histogenesis, but also in their histological structure.

In their gross appearance there is nothing distinctive. Under the microscope the lumina of blood and lymph spaces are seen to be distended with rapidly proliferating endothelium. The neighboring connective tissue and bloodvessels may be invaded. The individual cells assume a variety of shapes and are not always recognized as endothelial in origin. The flat cells become irregular in outline and swollen and the nuclei take a deep stain. It may be possible to identify these cells by tracing them to their origin in the walls of the vessels when they are not so changed in structure.

It is puzzling to differentiate between a carcinoma invading the lymph spaces and an endothelioma arising from the lymph spaces. In lymphatic carcinoma the appearance is that of veins of marble in the stroma.

SARCOMA OF THE UTERUS

From the older literature we are led to believe that sarcoma of the uterus is an extremely rare condition. Roger Williams and Gurlt reported 10 sarcomata in 6764 tumors of the uterus. Doubtless many sarcomata were regarded as carcinomata through failure to make a microscopic examination. Some were regarded as fibroids and were spoken of as recurrent fibroids. The growing frequency of reported cases is evidence of the discrepancies in previous reports.

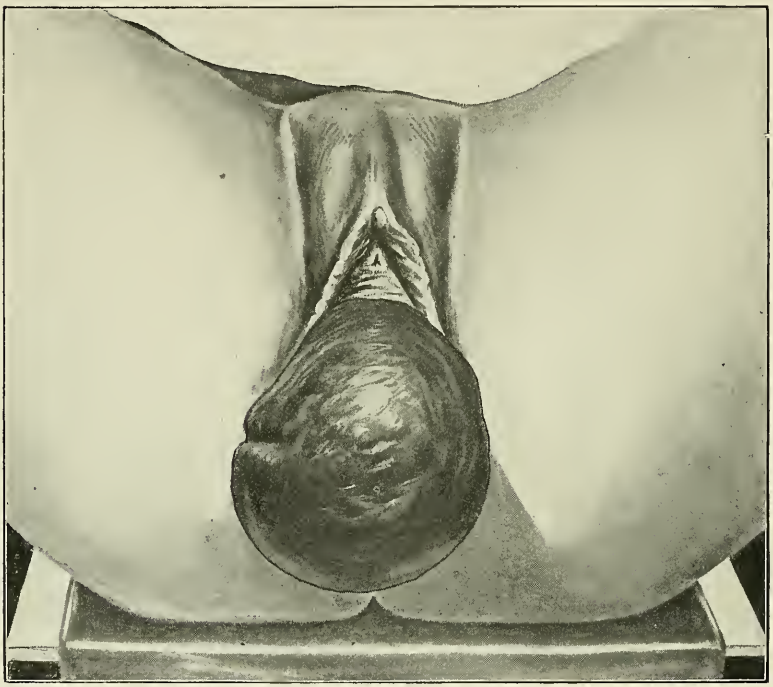
Whitridge Williams, in his *Contribution to the Histology and Histogenesis of Sarcoma of the Uterus*, reported 114 uterine sarcomata in the literature. The proportion of sarcoma to carcinoma of the uterus is said to be 1 to 40.

The frequency with which sarcoma of the uterus occurs is a somewhat debatable question. This is accounted for by the fact that this tumor is frequently mistaken for cancer and for fibroma. von Gurlt found in 2649 cases of uterine tumors, 1571 cancers, 883 fibroids, and 2 sarcomata. Roger Williams found 8 sarcomata in 4115 uterine tumors. Geisler, in 2369 cases, found 8 sarcomata, as compared with 405 cancers of the uterus and 288 fibroids. This gives a ratio of 1 sarcoma to 50 cancers. Veit found in 42,395 cases, 1493 cancers of the uterus and 40 sarcomata with 2 cases classified as doubtful; this gives a ratio of 1 sarcoma to 37.1 cancers.

Etiology.—Nothing is known of the essential cause of sarcoma. What has been said of Cohnheim's theory receives no confirmation in sarcoma. Inflammatory lesions and trauma seem to bear no causal relation, nor does childbearing. Fully two-thirds of the cases are found in women who either have not borne children or have given birth to less than the average number. We find no age exempt, from infancy to the postclimacteric period. A case has been lately reported

in which a hysterectomy was performed at three years of age. Pick reports a case at two years of age. Holländer's case was seven months old when the disease was first discovered. The oldest case recorded was seventy years. Gusserow reports 73 cases, of which 4 were under twenty-nine years of age; 15 were from thirty to forty years; 28 from forty to fifty; 18 from fifty to sixty, and 3 were over sixty years of age.

Fig. 463



Fibrosarcoma of the corpus uteri. A firm, rapidly growing tumor the size of a child's head protrudes from the vulva. Its attachment may be traced by a pedicle through the cervix to the fundus of the uterus. The tumor is not to be mistaken for inversion or prolapsus uteri, though either condition may be caused by the traction of the tumor.

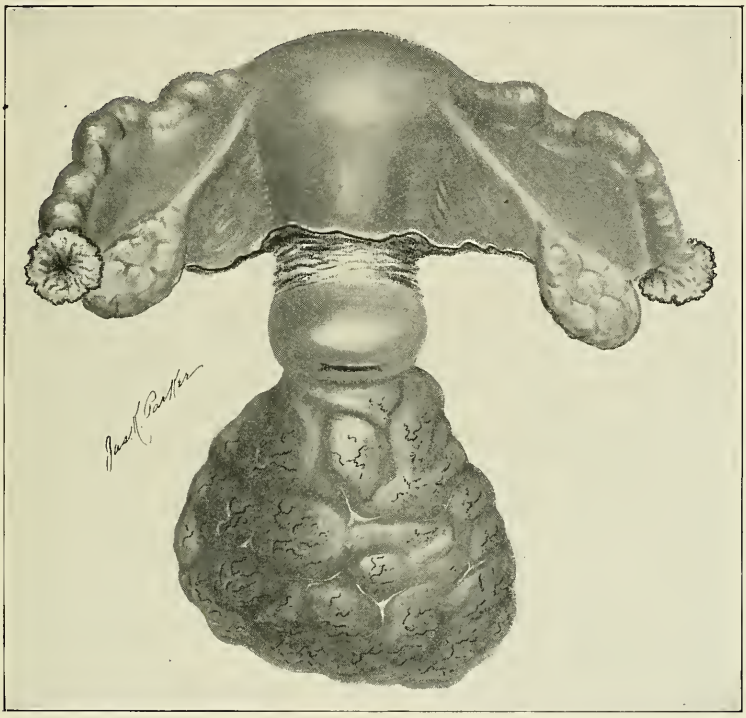
Anatomical Diagnosis.—As in carcinoma of the uterus, sarcoma is found in the vaginal portion of the cervix, in the cervical canal, and in the body of the uterus.

1. **Sarcoma of the Vaginal Portion of the Cervix.**—This is an uncommon location for sarcoma. To the naked eye there is no way of distinguishing this growth from carcinoma. There are the cauliflower and the infiltrating forms, resembling those found in carcinoma of the vaginal portion.

2. **Sarcoma of the Cervix.**—Sarcoma of the cervix is distinctive when assuming, as it usually does, a grape-like form (sarcoma botryoides). The mass protrudes from the external os and hangs into the vagina

as transparent vesicles, appearing not unlike a vesicular mole. This form is more often found in childhood, but may appear in old age. Pfannenstiel found 50 per cent. in nulliparæ. A similar growth is sometimes seen in the body of the uterus, due to edema or myxomatous degeneration of the growth. Carcinoma of the cervix never assumes this vesicular form.

Fig. 464



Sarcoma of the cervix. A tumor the size of a man's fist grew from the posterior lip of the cervix. It was of rapid growth, nodular, quite vascular, and friable. It was a mixed-cell sarcoma.

Various heterotopic structures are frequently mixed with the sarcomatous tissue; these are cartilage, bone, epithelial elements, and mucous tissue.

Sarcoma of the cervix may form a diffuse infiltration of the cervical tissue or protrude from the surface as a tuberculous, polypoid, or cauliflower growth.

3. **Sarcoma of the Body of the Uterus.**—Sarcoma of the body of the uterus arises from any of the mesoblastic structures. Very commonly the growth is a malignant transformation of a preëxisting fibroid tumor.

(*a*) *Sarcoma of the submucosa* may take the form of a diffuse infiltration or of a papillary, polypoid, or nodular growth projecting from the surface. The surface of these growths is never shaggy as in carci-

noma. The color varies from pale gray to dark red. Their consistency is soft and often friable. The growth rarely begins as a diffuse involvement of the mucosa, but rather as a circumscribed lesion extending by continuity of surface and by metastasis.

(*b*) *Sarcoma of the wall of the uterus* generally arises from submucous or interstitial fibroids. The fibrous structure of the tumor gives place to a homogeneous substance of soft consistency, varying in color from pale gray to dark red. The growth is rapid as compared to that of a fibroid. Recurrent fibroids were recognized in the days when the microscope was little used. They are now regarded as fibrosarcomata.

Sarcoma spreads through the uterine wall to the peritoneum and to the abdominal and pelvic viscera. Metastasis to neighboring organs and to lymphatic glands is unusual. The point of earliest attack is the lung. The ovary is the seat of secondary invasion more often in sarcoma than in carcinoma.

Microscopic Diagnosis.—As elsewhere in the body, sarcoma is classified as round cell, spindle cell, or giant cell. There is frequently a mixture of these cells.

1. **Round-cell Sarcoma.**—Round-cell sarcoma is composed of large or small round cells having a large nucleus and a limited rim of protoplasm. The diameters of the cells vary from 4 to 15 mm. There is a variable amount of chromatin and an abundance of karyokinetic figures. Numerous newly formed bloodvessels are seen. The sarcoma cells border directly upon blood-spaces.

2. **Spindle-cell Sarcoma.**—Spindle-cell sarcoma is composed of large or small elongated cells, arranged in bundles and bands. On section they appear in various forms from round to spindle. Two or more nuclei are observed. The amount of chromatin varies greatly.

3. **Giant-cell Sarcoma.**—Giant-cell sarcoma is a rare finding in the uterus. These cells may be 80 mm. in diameter. They are polynuclear, and are rich in chromatin and mytotic figures. The nuclei vary in shape and in staining qualities. Vacuoles may be present.

In all the above forms the fibrillar network may be so scanty that it escapes notice, or so abundant that the name fibrosarcoma is suggested. As a rule, the connective-tissue framework is distributed uniformly between the cells, but nests of cells may be surrounded by connective tissue, giving the appearance of cancer nests (alveolar sarcoma). Newly formed bloodvessels are prominent features of sarcoma, and may be sufficiently abundant to give to the tumor the name angiosarcoma.

The intimate association of the blood-channels with the surrounding sarcoma cells is characteristic. No sharp distinction can be made between the three microscopic forms. A mixture of two or three varieties of cells is the rule.

Secondary changes in sarcoma tissue are of common occurrence, though not so frequent as in carcinoma, for the reason that sarcoma cells are more directly supplied with blood. Degenerative changes ordinarily begin in the centre of the sarcoma. The cells at the periphery do not

usually suffer change. The degenerative forms commonly seen are the hemorrhagic, hyaline, and fatty.

Mixed Tumors.—The tendency of sarcoma cells to assume the mature type accounts for the frequency of the so-called myosarcoma of the uterus. Myxosarcoma is a myxomatous degeneration of the connective-tissue stroma. Enchondrosarcoma, carcinosarcoma, and melanosarcoma are of extremely rare occurrence.

Clinical Diagnosis.—All that has been said of the clinical diagnosis of carcinoma of the uterus applies to sarcoma. The clinical manifestations and physical findings do not materially differ from carcinoma. The differential diagnosis of carcinoma from sarcoma must depend upon the microscope.

The early recognition of sarcomatous degeneration of a fibromyoma is of the utmost importance. When a fibromyoma of the uterus undergoes malignant changes it takes on rapid growth, becomes softer in consistency, more pain is experienced in the region of the tumor, cachexia rapidly develops, ascites may make its appearance, and metastatic growths may arise in the lungs and elsewhere. If the tumor is interstitial or submucous, the hemorrhages will be greater. When a fibroid takes on a rapid growth, particularly if near the time of the menopause, no time should be lost in removing the growth. When after removal of a fibroid the growth returns, it is suggestive of sarcoma.

The length of time a sarcoma may exist before destroying life is variable, and has been observed from two months to five years. The average time is estimated at two years.

Because of the frequency with which a sarcomatous degeneration of a fibroid tumor of the uterus is overlooked, the following suggestions as to the clinical recognition of sarcomatous degeneration of uterine fibroids is here presented.

Suspicion, sufficient to justify operative interference, is aroused when:

1. The tumor takes on a rapid growth in the absence of pregnancy.
2. The tumor becomes soft.
3. The growth becomes manifest near the time of the climacterium.
4. The tumor occasions bleeding in advanced age.
5. Ascites and loss of flesh with cachexia accompany the growth.
6. There is recurrence of a fibroid that was once removed.

Prognosis.—As with all malignant tumors the prognosis in sarcoma of the uterus is uncertain, no matter how early the growth is discovered and removed.

We cannot rely upon the statistics of the older writers because of the frequent discrepancies in diagnosis. Veit asserts that the average length of life in sarcoma of the uterus is two to three years. Cases are reported in which life was prolonged over a period of ten years.

Metastasis is not as common as in carcinoma. Gessner records 33 cases in which metastasis occurred but nine times. The lungs, liver, intestine, omentum, kidney, and pleura are attacked with greatest frequency and in the order named.

When death occurred without operation, Gessner in 99 cases found the following causes for death:

Cachexia and metastasis	57
Septic diseases	28
Nephritis	5
Ileus	4
Intercurrent diseases	3
Uremia	1
Lung embolism	1

In general, we may say that the prognosis of sarcoma is no better than that of carcinoma of the uterus.

Treatment.—So uncertain is the early recognition of sarcoma of the uterus, and so speedy does it become inoperable through metastatic invasion, that the only safe procedure is to operate on a well-grounded suspicion. The suspicion should be verified when possible by the microscopic examination of excised pieces or scrapings.

In operating fibroid tumors of the uterus, they should be incised after removal, and if the bands and whirls are found to be replaced by a grayish semitranslucent mass, the entire uterus and adnexæ should be removed.

The technic of operation does not differ essentially from that of the classical abdominal hysterectomy. Special precautions must be taken to prevent troublesome hemorrhage.

CHAPTER XXIX

TUMORS OF THE PELVIC LIGAMENTS, FALLOPIAN TUBES, AND OVARIES

- Tumors of the Pelvic Ligaments
  - Tumors of the Broad Ligaments
  - Tumors of the Ovarian Ligaments
  - Tumors of the Round Ligaments
  - Treatment
- Tumors of the Fallopian Tubes
  - Papilloma
  - Polyps
  - Myoma and Fibroma
  - Dermoid Cysts
  - Lipoma
  - Fibromyxoma Cystoma of the Fimbriæ
  - Sarcoma
  - Carcinoma
  - Cystic New-formations of the Fallopian Tubes
  - Hydatids of Morgagni
- New-formations of the Ovary
  - Simple Cysts
    - Follicular
    - Corpus Luteum Cysts
    - Tuboövarian Cysts
  - Cysts of the Ovaries
  - Carcinoma
  - Dermoid Cysts
  - Connective Tissue New-formations
    - Fibroma
    - Myoma
    - Myxoma
    - Enchondroma and Ostioma
    - Angioma and Lymphangioma
  - Sarcoma
  - Endothelioma
  - Parovarian Cysts
  - Ovariotomy
    - Vaginal
    - Abdominal
    - Malignancy of Ovarian Tumors
  - Treatment of Ovarian Tumors Complicating Pregnancy, Labor, and the Puerperium
  - Postoperative Complications
    - Mortality
  - Conservative Operations

TUMORS OF THE PELVIC LIGAMENTS

1. **Tumors of the Broad Ligaments.**—Primary tumors of the broad ligaments are rare; they are classified as benign and malignant.

(*a*) Benign tumors of the broad ligament are fibromata in nearly all instances. They develop from the unstriped muscle fiber between the peritoneal folds of the broad ligaments. They are rarely large, but are known to extend upward to the umbilicus and downward to the pelvic floor and vaginal walls. Lipomata of the broad ligaments are reported, though they are very rare.

(*b*) Malignant tumors of the broad ligaments are secondary to primary growths in the neighboring organs, notably the uterus, more rarely the Fallopian tubes and ovaries. Cancer and sarcoma are the two varieties found, the former being by far the more common.

2. **Tumors of the Ovarian Ligaments.**—The most common tumor of the ovarian ligament is a fibroma. They are rare, and seldom grow larger than a hen's egg. Cancer and sarcoma have been reported.

3. **Tumors of the Round Ligament.**—Fibroma, carcinoma, and sarcoma are found in the round ligaments; the former are the most common, though all are rare.

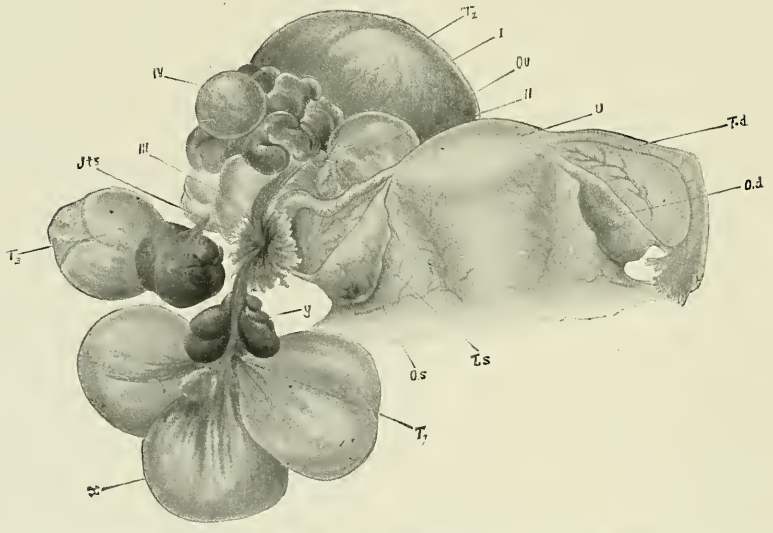
Fibroid tumors of the round ligament may arise from the pelvic portion of the ligament or from the extraperitoneal portion. In the latter case they are located in the inguinal canal or labium majus. They do not differ in their microscopic or macroscopic features from fibroids of the uterus.

Treatment of Tumors of the Pelvic Ligaments.—All benign tumors should be enucleated as soon as recognized. Malignant tumors rarely permit of operative interference.

TUMORS OF THE FALLOPIAN TUBES

New-formations of the Fallopian tubes are of rare occurrence. Those described are papilloma, polyp, myoma, fibroma, dermoid cyst, lipoma, fibromyxoma, cystoma, sarcoma, carcinoma, endothelioma, syncytioma malignum.

FIG. 465



Fibromyxoma fimbriarum tubæ cystosum. *U*, uterus; *Td*, right tube; *Od*, right ovary; *Ts*, left ovary; *Its*, left infundibulum of the tube; *Os*, left ovary; T_1I, pedunculated tumor; T_2II, pedunculated tumor; T_3, secondary pedunculated tumor; *Ov*, calcareous body resembling an ovary; *X*, cyst containing dark yellow fluid; *y*, gelatinous tissue without cavities; *I*, blood-cysts with blood detritus; *II*, blood-cyst with fresh blood; *III*, soft myxomatous tumor; *IV*, soft myxomatous tumor. (Martin.)

Papilloma.—Papilloma arises from the endosalpinx. Sänger was able to collect only six cases in the literature. Simple papilloma takes the form of a villous or cauliflower growth which may distend the tube. The villosities may adhere and lock in cystic spaces. The

growth is histologically constructed of connective tissue, covered by a single layer of columnar epithelium, having no disposition to invade the connective tissue, as is the case in malignant papilloma. Metastasis does not occur. It has been suggested by Doran that benign papillary growths are of inflammatory origin. He bases his opinion on a certain definite inflammatory reaction seen to accompany the growth. He believes gonorrhea to be a potent factor.

Polyps.—Polyps of the tube are virtually inflammatory lesions. They are rarely found.

Myoma and Fibroma.—Myoma and fibroma of the tube are not to be mistaken for the nodular swellings of salpingitis isthmica nodosa. Five cases are reported by Sänger. Bland Sutton reported one the size of an orange. v. Recklinghausen reported an adenomyoma of the tube arising from the duct of Müller.

Dermoid Cysts.—Dermoid cysts of the tube are described by Pozzi and Richie.

Lipoma.—Lipoma is not of such unusual occurrence in the tube. It is usually located between the two layers of the mesosalpinx, and has been known to attain the size of a hen's egg.

Fibromyxoma Cystoma of the Fimbriæ.—Fibromyxoma cystoma of the fimbriæ was described by Sänger (Fig. 465). There were three tumors connected by fimbriæ to a normal tube. They consisted of fibrous and myxomatous tissue.

Sarcoma.—Sarcoma of the tube has a papillary structure that cannot be distinguished from benign papilloma or carcinoma by the naked eye. But five cases are recorded.

Carcinoma.—Carcinoma of the Fallopian tube may be primary or secondary. Secondary cancer of the tube is not rare but primary cancer of the tube is exceedingly rare. As a primary growth it is rarely bilateral. The growth is usually papillary, rarely alveolar. The development is rapid and metastasis is early. The naked-eye appearance of the tube is not unlike that of a hydrosalpinx. The suggestion is pertinent to bisect all suspicious tubes removed in the cancer-bearing age, and if a papilloma is found, to perform a radical removal of not only the tube but the uterus, opposite tube and ovaries.

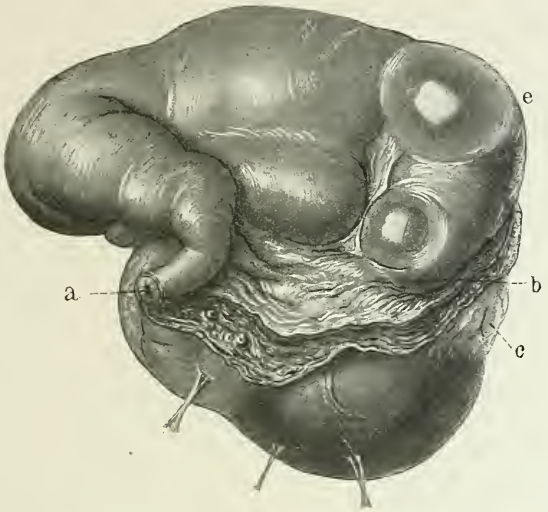
An excellent monograph on the subject by Norris appears in the *Journal of Surgery, Gynecology, and Obstetrics,* March 1909.

Orthmann was the first to describe primary carcinoma of the tube. Like other new formations of the tube, carcinoma assumes a papillary form, and in its histological structure is not unlike papillary adenoma of the ovary and malignant adenoma of the uterus. Secondary carcinoma of the tube resembles the primary growth, and is usually an extension from a similar growth in the uterus. One-third of the primary carcinomata of the ovary extend to the tube. It has been repeatedly observed that inflammatory lesions of the tubes serve as forerunners of carcinoma.

Le Count says: "It is especially concerning tumors of the Fallopian tube that confusion has arisen; there has been quite a general failure

to recognize that a diffuse hyperplastic inflammation is possible—a process that is strictly analogous to the polypous hyperplasia of other mucous surfaces—and that in certain typical examples it is as distinct from tumor growth as gastritis proliferans is from carcinoma of the stomach." He believes it is fully demonstrated that there exists an imperceptible transition of hyperplastic processes of the tubal mucosa into those of true tumor growth, and that these may terminate in the production of benign tumors and then into a malignant new-formation.

FIG. 466



Primary carcinoma of the tube. (Natural size.) *a* is the proximal end of the tube and *b* the occluded fimbriated extremity. Near the uterus the tube is nearly normal in size, but rapidly enlarges until near the fimbriated extremity it is 3 cm. in diameter. At *e* are two subperitoneal cysts. The ovary, *c*, contains a small cyst with dark-colored walls. Attached to the under surface of the ovary are several adhesions. (Hurdon.)

We find carcinoma of the tubes occurring about the time of the menopause—a time when inflammatory lesions are less frequent.

Sänger-Barth observed a direct malignant degeneration of the tubal mucosa. Doran and Fearne observed a malignant transformation in a benign papilloma.

Carcinoma of the Fallopian tube is commonly unilateral. Zangemeister reported three cases of primary carcinoma of the tube, all of which were bilateral. All six tubes presented the external appearance of sactosalpinx. The tube walls were thin. Within the tubes were papillary growths which, under the microscope, resembled adenocarcinoma of the uterus. Zangemeister found fifty-one cases in the literature. According to Sänger-Barth, it usually arises from the middle and outer portions of the tube.

In conformity with many authors we will recognize two microscopic forms, the papillary and the alveolar.

The papillary form consists of numerous papillæ, composed of connective tissue and covered by columnar epithelium.

Alevolar carcinoma of the tube shows a greater proliferation of the epithelium, and the grouping of these epithelial elements into nests.

Cystic New Formations of the Fallopian Tubes.—Hydatids of Morgagni.—Hydatids of Morgagni are transparent cysts containing a clear, watery fluid. They are found on the peritoneal covering of the tube and broad ligament, either isolated or arranged in groups. The fimbriæ of the tube may distend with a similar fluid and present the appearance of cysts of Morgagni.

Cysts as large as walnuts have been found in the mucosa of the tube, and are inclusions of the mucous folds.

Cysts of equal size are found in the musculature. These arise from the ducts of Gärtner.

The following classification is from Sänger:

1. Serous cysts, lying beneath the serous covering of the tube and varying in size to a child's head.
2. Lymphangiectasis.
   (*a*) Small cysts on the tube and ligament.
   (*b*) Winding canals or cysts located under or within the peritoneum of the tube and broad ligament.
   (*c*) Lymphangiectatic cysts, large and isolated, located in the subserosa of the tube and in the mesosalpinx.
3. Hydatids of Morgagni are to be regarded as physiological, and are located at the ends of the fimbriæ.

NEW-FORMATIONS OF THE OVARY

Simple Cysts.—Among simple cysts of the ovary will be included those cystic formations occupying an intermediate position between the cystic inflammatory lesions and the cystic new-formations.

1. **Follicular Cysts.**—(See page 484.)

2. **Corpus Luteum Cysts.**—Corpus luteum cysts, as the name implies, arise from the corpus luteum, and hence are single and are located on the periphery of the ovary. As compared with follicular cysts, they are thick-walled. In size they vary from a bean to a man's head.

The wall of the cyst presents the characteristic yellow, corrugated appearance of the luteum cell layer, and external to this is the pale, fibrous envelope. The contents of the cyst are commonly a clear, serous fluid; this is occasionally mixed with blood and degenerated cells.

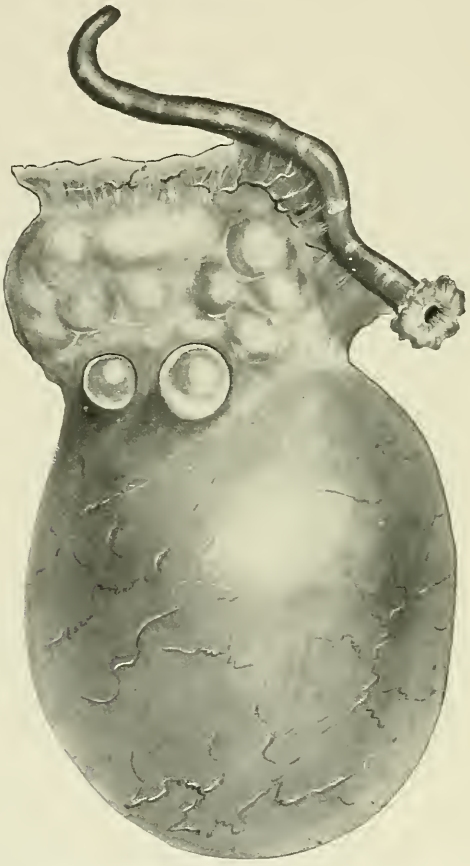
3. **Tuboövarian Cysts.**—These have been previously referred to. Rosthorn gives the following groups in explanation of the origin of tuboövarian cysts:

Group I.—1. Cases in which a pyosalpinx becomes adherent to the wall of an ovarian abscess, with subsequent communication established between them. Later the formed elements of the pus are absorbed, leaving a serous fluid.

2. Adhesions of the pavilion of the tube to the wall of a suppurating ovarian cyst, with subsequent development of hydrosalpinx and perforation of the cyst into the tube.

3. Adhesions of a hydrosalpinx to a papillomatous cyst, with subsequent perforation of the intervening wall by papillary growths.

Fig. 467



Corpus luteum cyst. Numerous small follicular cysts are seen in the substance of the ovary. At the periphery of the ovary is a thin-walled cyst, double the size of the ovary, and originating in a corpus luteum. (Specimen removed by Dr. J. Clarence Webster.)

Group II.—1. Cases in which a hydrosalpinx becomes adherent to the wall of a follicular cyst, with subsequent perforation of the septum.

2. Cases in which the fimbriæ of a previously diseased tube are caught in the opening of a ruptured follicle at the moment of rupture and become adherent to the wall of the follicle.

Anatomical Diagnosis.—A tuboövarian cyst may distend to the size of a child's head. The general form is that of a retort. The wall is

thin and transparent. Occasionally there are adhesions about the cyst. No ovarian tissue is in evidence.

Fig. 468

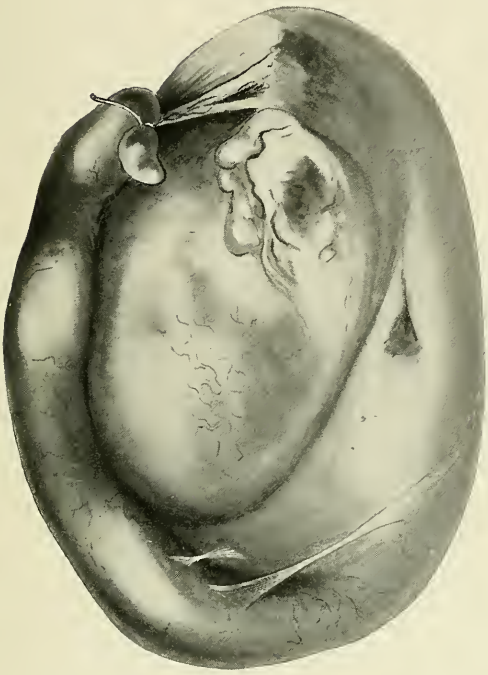


Fig. 469

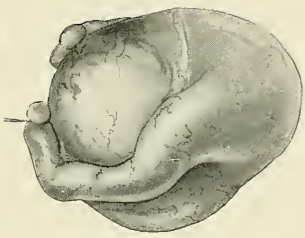
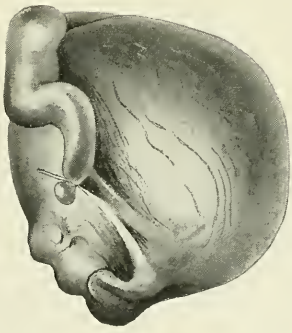


Fig. 470

Fig. 471



Figs. 468 to 471.—Four different views of tuboövarian cyst.

The interior of the cyst resembles a hydrosalpinx on one side and a follicular or corpus luteum cyst on the other. There is but a single cavity. The point of union of the cyst and tube is sharply defined.

The tubal portion is lined with ciliated epithelium and the ovarian portion, either with a fibrous or granular surface layer, or with a low type of epithelium. The contents is clear serum, rarely blood-stained.

Clinical Diagnosis.—The clinical diagnosis cannot be made from hydrosalpinx. The diagnosis is only made by a careful examination of the specimen after its removal.

Tumors of the Ovaries.—Etiology.—Ovarian tumors were found in 1.4 per cent. of 36,158 cases in Martin's clinic. The following table from Stander shows the relative frequency of various tumors of the ovaries:

Cystadenoma	205	= 69.49 per cent.
Carcinoma	40	= 13.56 per cent.
Embryoma	26	= 8.81 per cent.
Sarcoma	20	= 6.78 per cent.
Fibroma	4	= 1.36 per cent.

Referring to the *age* at which ovarian tumors appear, we find Doran reporting a case of sarcoma of the ovary in infancy, and Homans operating upon a tumor of the ovary at eighty-two years of age. The following is a table prepared by Olshausen, in which are given the number of tumors found and the respective ages of the patients:

61 under	10 years
490 between	20 and 29 years
499 between	30 and 39 years
372 between	40 and 49 years
342 at	50 and over

It will be seen from the above table that tumors of the ovary occur with about equal frequency between the ages of twenty and fifty years.

The *social state* has no influence upon the development of ovarian tumors; they occur with about equal frequency in the single and married. They may be the cause of sterility, but it is not likely that sterility predisposes to their development.

While two or more members of the same family have been known to be afflicted with ovarian tumors, it is not believed that *heredity* plays a role in the development of these neoplasms. In 1000 cases of Spencer's, 8.2 per cent. were bilateral, while Olshausen gives 13.7 per cent. in 322 cases.

Classification.—The old classification of tumors of the ovary into cystic and solid tumors was of the greatest service when the operative treatment was limited to the tapping of fluid. At the present time, when tumors of the ovary are removed *en masse*, such a classification does not meet the requirements.

Tumors of the ovary are classified as *benign* and *malignant*. Waldeyer classifies them according to their histology and histogenesis into *epithelial* (parenchymatous) and *connective-tissue* (interstitial) forms. Either of these forms is benign or malignant, and may be cystic or solid. A combination of the parenchymatous and interstitial forms are the so-called mixed tumors. From these sources are derived the benign and malignant, the cystic and the papillary tumors.

A typical adenoma is rarely seen. More often there is a combination of adenoma and fibroma (adenofibroma). When the gland spaces widen we speak of cystadenoma. These large cystic spaces

FIG. 474

Multilocular cyst of the ovary. The ovary is converted into two large cysts with serous contents. A fresh corpus luteum is seen on the surface of the smaller cyst. The tube is normal. (Specimen removed by Dr. J. Clarence Webster.)

result from the distention of glands by the retained secretions (non-proliferating cysts) and from proliferation of the epithelial and connective-tissue elements, in addition to the distention of the glands.

The secretion of these cysts differs. Pfannenstiel introduced the terms *cystadenoma pseudomucosum* when the contents are of a mucous character, and *cystadenoma serosum* when the contents are serous fluid.

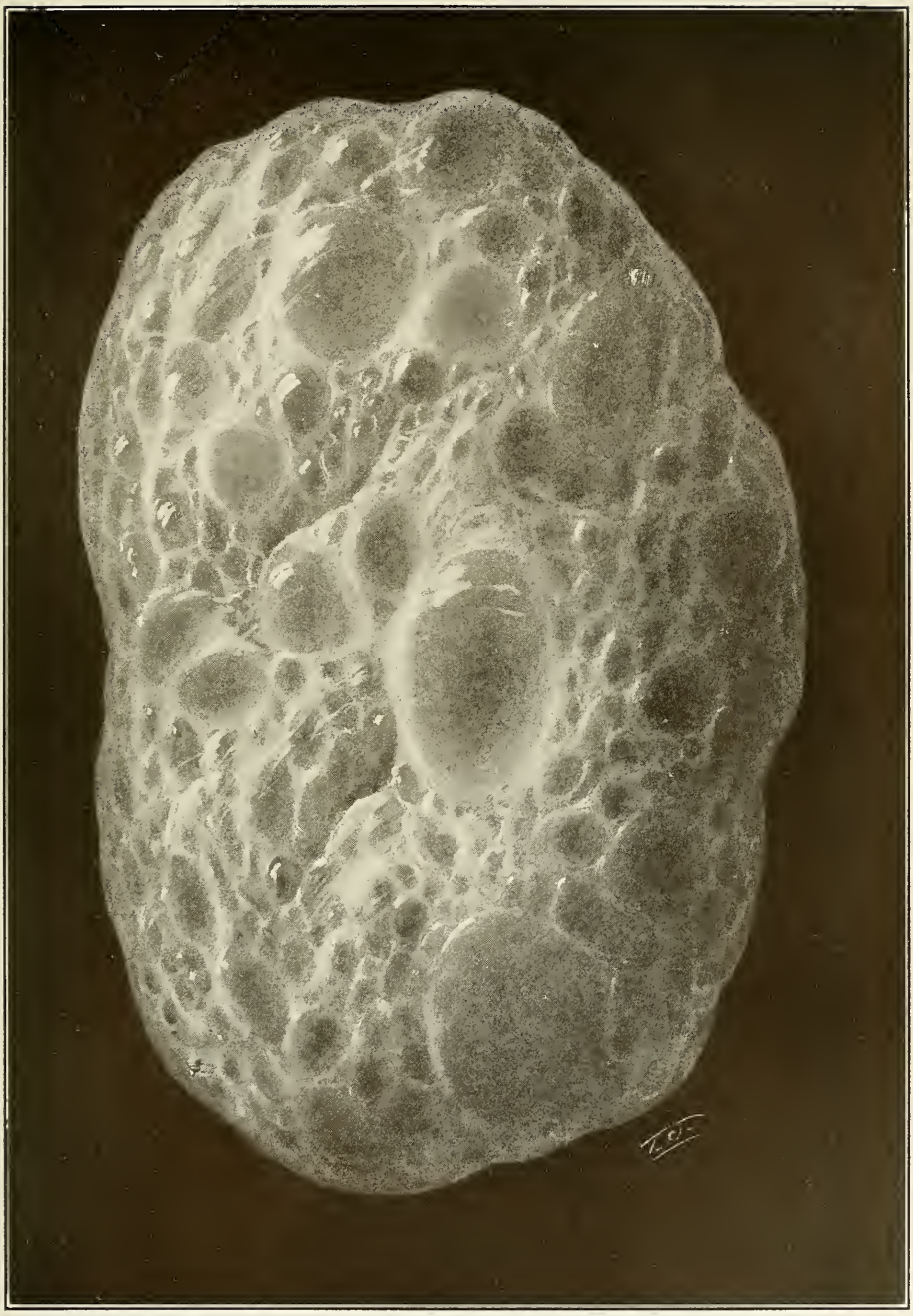
The purely granular type may be found, or papillæ may spring from the surface of the cyst. It is possible to have a papillary cyst on one side and a glandular cyst on the other. One may be intraperitoneal and the other extraperitoneal. They are rarely of equal size.

FIG. 473

Multilocular proliferating cyst of the ovary. There are numerous small cysts and one large, thin-walled one. Such a cyst is not self-limited in its growth, and may attain an enormous size. (Specimen removed by Dr. J. Clarence Webster.)

Intraperitoneal cysts are pedunculated and are usually freely movable, while extraperitoneal cysts seldom have a pedicle and are fixed. Such extraperitoneal cysts are usually completely enfolded in the broad ligament, but are sometimes partly within the free peritoneal cavity. Cysts of very large dimensions may have but a single cavity, but, as a rule, one or more smaller cysts lie within the parent cyst and are

PLATE XXXII



Multilocular Pseudomucinous Cystadenoma of the Ovary.
(Hertzler.)

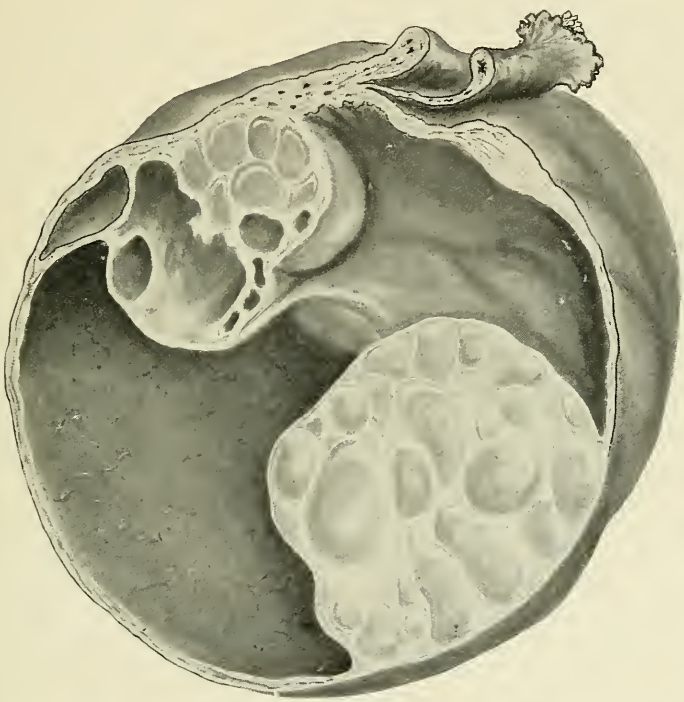
PLATE XXXIII

Cross-section of a Pseudomucinous Cystadenoma of the Ovary.
(Hertzler.)

known as daughter cysts. These smaller ones may give an irregular surface and a variable consistency to the original cyst. By rupture of the daughter cysts into the parent cyst, a multilocular cyst may be converted into a unilocular cyst. There are usually some remnants of the walls of the daughter cysts left in the form of ridges and bands.

As the cyst enlarges the wall becomes thinner, more transparent, and glistening. In the wall of the cyst many bloodvessels are seen to take an irregular course; the veins are larger and more numerous than the arteries.

FIG. 474

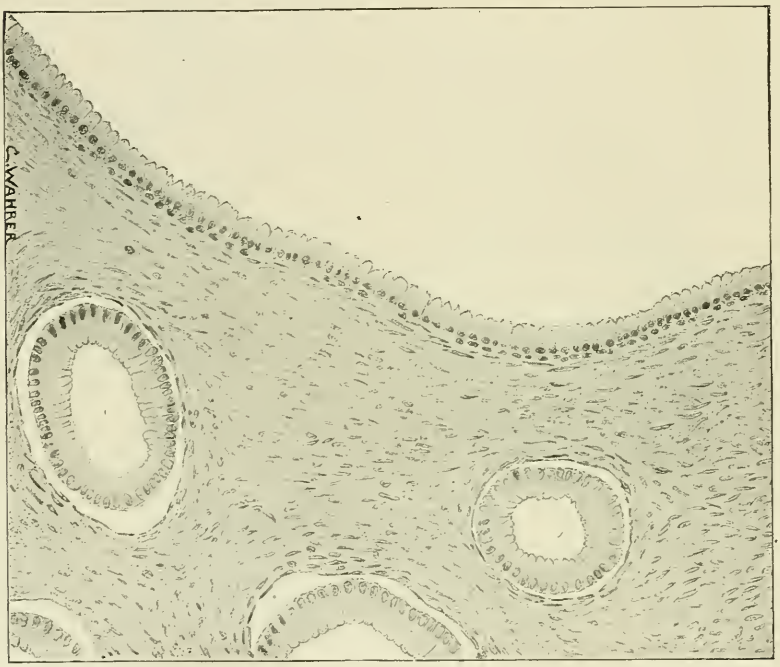


Cross-section of a multilocular pseudomucinous cyst of the ovary. The parent cyst contains a number of daughter cysts of similar structure and containing a mucinous substance.

Villous projections are frequently seen growing from the inner surface of the cyst wall. The villosities vary in size and extent and form wart-like excrescences, sometimes long and slender, like a feather. The framework of the papillæ is of connective tissue in which bloodvessels course. Covering the stroma are one or more layers of columnar epithelium, showing many irregular foldings and reduplications which might be mistaken for malignant proliferation. The connective-tissue growth does not keep pace with that of the epithelium. Similar papillary growths appear on the external surface of the cyst. These arise either from the surface epithelium or from within the cyst, and subsequently penetrate the wall.

Microscopic examination of the cyst wall shows a vascular framework of connective tissue with more or less round-cell infiltration. In the smaller cysts true ovarian tissue is sometimes present. On the outer surface of the cyst wall, germinal epithelium is commonly seen, though it may be partially or wholly lost. The inner surface is lined with a secreting epithelium of cylindrical form and often ciliated. This epithelium remains intact, whatever the size and age of the cyst. To the unaided eye the inner surface appears not unlike the mucous membrane of the stomach.

Fig. 475



Pseudomucinous ovarian cyst. The cyst is lined within by a single layer of high columnar epithelium with an oval nucleus near the base of the cell. The cyst wall is composed of connective tissue containing gland-like structures.

When nutrition is insufficient certain retrogressive changes follow. Occasionally the cyst contents are absorbed, and the cyst wall contracts, thereby diminishing its size.

Calcareous degeneration of the cyst wall may be partial, or, as in the case of Leopold, complete.

Other secondary changes in the cyst, to be described later, are hemorrhage into the cyst, torsion of the pedicle, rupture of the wall, infection of the contents, and malignant degeneration.

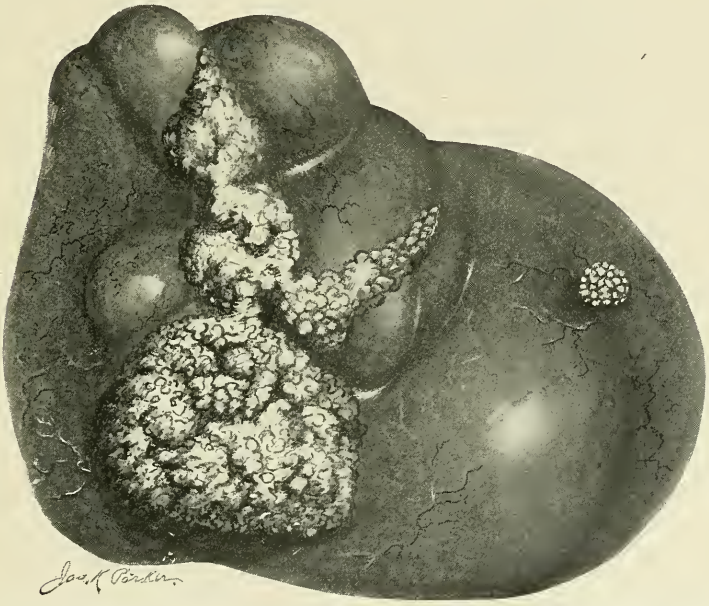
Rupture of a cyst may be followed by closure of the rent and refilling of the cyst, or the rent may remain open and the contents be discharged

continuously into the peritoneal cavity. In exceptional cases the cyst shrinks and disappears after rupture.

If the contents of the cyst are serous, the escaped fluid will be absorbed, but if mucus escapes into the peritoneal cavity, absorption is slow and a pseudomyxomatous peritonitis may possibly develop. Small hemorrhages into the cyst wall are of common occurrence, and have no clinical significance. Hemorrhagic effusions into the cyst wall predispose to rupture, and life may be endangered by the rupture of large bloodvessels.

When torsion of the pedicle shuts off the blood supply and there are no adhesions through which nourishment is carried to the cyst, atrophy or gangrene of the cyst will follow. It is possible for adhesions to convey sufficient blood to fully nourish the cyst and even permit it to increase in size.

FIG. 476



Multilocular papillomatous cyst of the ovary. An irregular multilocular cyst of the ovary has on its surface a large irregular area of benign papillomatous growths. These warty growths tend to spread over the surface of the cyst and over all peritoneal surfaces in the abdomen. The extension of the growth is by continuity of tissue, not by metastasis in the benign form.

(*a*) *Cystandenoma pseudomucinosum* (Hammarstan) contains a mucinous secretion, clear and transparent, or turbid from cell debris and blood. A large amount of blood may give a chocolate color to the fluid. White, flocculent particles float in the fluid. These consist of mucin, cell debris, cholesterin, blood corpuscles, and fat droplets. The epithelium lining the cyst is a single layer of high, slender, cylindrical cells, with clear, transparent bodies and oval nuclei near the base.

The pseudomucinous cysts are by far the most common of the large

ovarian cysts. They are commonly adenomatous, rarely papillomatous, though a limited number of papillary growths are often found projecting from the cyst wall.

According to Martin more than two-thirds are unilateral and only about 7 per cent. are extraperitoneal. The largest recorded cyst weighed 245 pounds.

(*b*) *Cystadenoma serosum* contains a clear serous fluid of a pale green color; it is rarely turbid from admixture with cell debris, or chocolate color from admixture with blood.

Fig. 477

Cross-section of a multilocular papillomatous cyst of the ovary. Growing from the outer and inner surface of the cyst are papillary growths. The contents of the cyst is serous fluid. Microscopic examination of a papillomatous growth, including the cyst wall, shows the growth to be benign.

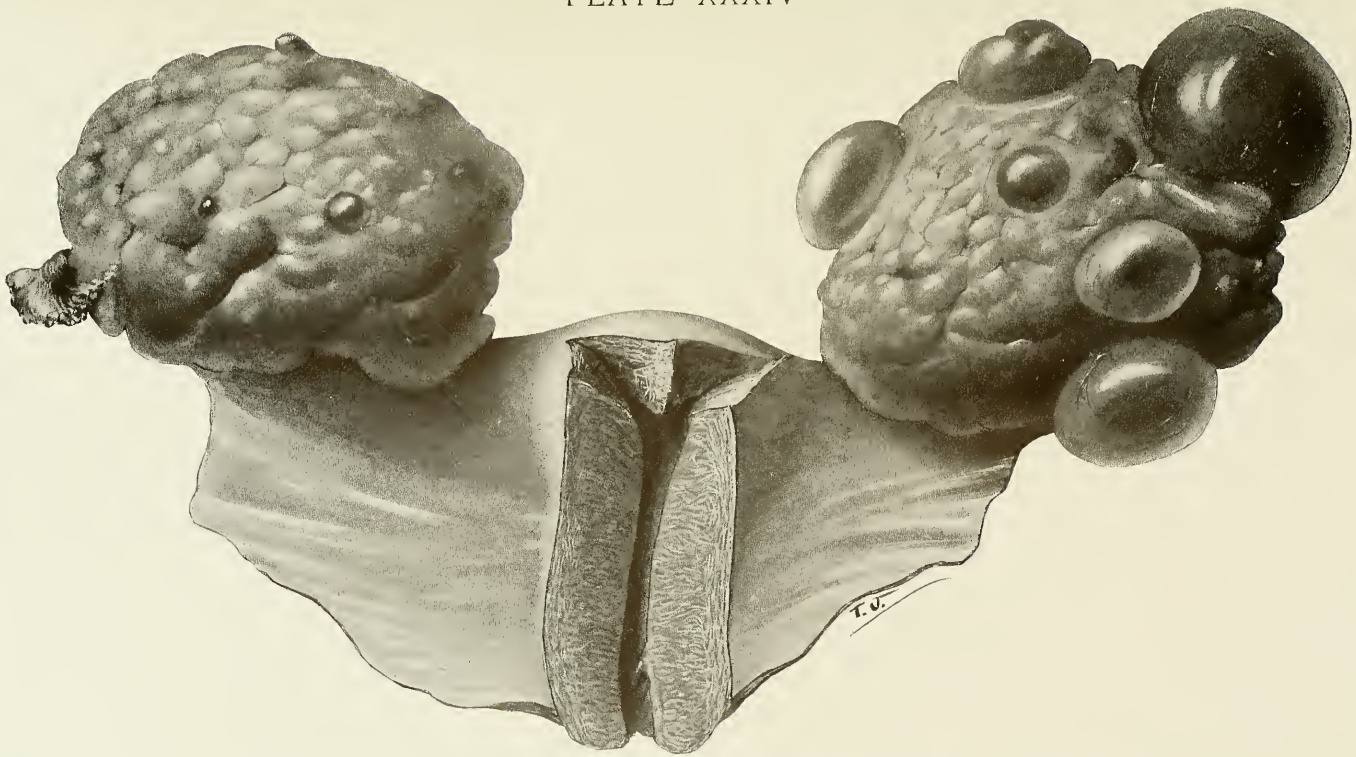
These cysts rarely attain the enormous size of the mucinous variety. They are frequently papillary, and as such are often bilateral.

Papillary growths may not only cover the inner surface of the cyst and penetrate to the outer, but may spread by continuity of tissue to the peritoneum, where by mechanical irritation ascitic fluid is secreted.

A papillomatous growth of the ovary without cystic formation is an unusual condition. The secreting epithelium consists of low, cylindrical-shaped cells, with round nuclei near the centre.

Carcinoma.—Our knowledge of primary carcinoma of the ovary is very limited. The majority of carcinomata are secondary.

PLATE XXXIV



Bilateral Carcinoma of the Ovary (Kruckenburg Tumor). (Hertzler.)

PLATE XXXV

Adenocarcinoma of the Ovary.

The ovary is enlarged to the size of a child's head. It is made up of large lobules, and the surface is nodular and very vascular. Within the tumor are several small cavities filled with a bloody fluid. A similar tumor was found on the opposite side. (Specimen was removed by Dr. J. Clarence Webster.)

Classification.—Waldeyer gives the following classification:

1. Simple (carcinoma simplex).
2. Medullary (carcinoma medullaris).
3. Scirrhus (carcinoma scirrhosum).

Many secondary forms may be added, such as atrophic, colloid, melanotic, sarcomatous, gelatinous, and microcystic.

The frequency of carcinoma of the ovary is stated by Martin as 13.6 per cent. of his cases of ovarian tumors.

About three-fourths of them are unilateral. Bilateral invasion of the ovary is always associated with involvement of the peritoneum and other structures, and hence is inoperable.

As pointed out by Sutton, it is a curious rule that organs which are frequently the seat of primary carcinoma are rarely the seat of secondary deposits, and *vice versa*. This is exemplified in the ovary. In primary carcinoma of the mammary gland the ovaries were invaded 5 times in 85 cases (Coupland). Sutton found the ovaries invaded 6 times in 52 cases of inoperable carcinoma of the uterus, and 3 times in 29 cases of inoperable carcinoma of the breasts.

Olshausen says an important feature in the clinical history of ovarian cancer is the fact that it often occurs at an early age, and may even develop during childhood. The following table was constructed by Olshausen:

8 to 19 years	19 patients
20 to 29 years	17 patients
30 to 39 years	8 patients
40 to 49 years	15 patients
50 years and above	17 patients

Anatomical Diagnosis.—In solid carcinomatous tumors of the ovary, the general form of the ovary is maintained. The surface is uneven and studded with tubercles, nodules, or papillary growths. Rarely is the surface smooth. It is unusual to find normal ovarian tissue, yet the occurrence of pregnancy in bilateral involvement of the ovaries shows that some follicles remain healthy. In the large tumors cystic spaces are invariably present. Malignant degeneration of ovarian cysts is of more common occurrence. In all forms of carcinoma of the ovary, the carcinoma cells maintain their cylindrical shape and form cancer nests or gland-like structures, not unlike those found in carcinoma of the Fallopian tube.

Papillary growths which have perforated a cyst wall are prone to undergo malignant degeneration and to rapidly spread to the peritoneum. As pointed out by Abel, when cancerous degeneration is suspected, the cyst should not be tapped before removal for fear of contaminating the peritoneum and setting up metastatic growths.

Metastasis does not occur so widely in carcinoma of the ovary as in carcinoma of the uterus. The most likely points of invasion are the peritoneum, omentum, and retroperitoneal glands.

Squamous-cell carcinoma of the ovary has been observed in dermoid cysts.

Dermoid Cysts.—Dermoid cysts, as the name suggests, are cystic tumors containing skin structures.

In Martin's classification we find simple dermoid cysts, complicated dermoid cysts, cystic teratoma, and solid teratoma.

A simple dermoid cyst is a sac lined with a dermal membrane. A complicated dermoid cyst is lined with skin and contains heterogeneous structures, such as glands, bone, and teeth. A cystic teratoma contains formed organs, such as brain, mammary glands, thyroid glands, etc. A solid teratoma contains no large cysts and is composed of structures similar to those found in ordinary teratomata.

FIG. 478

Multilocular dermoid cyst.

Anatomical Diagnosis.—A dermoid cyst may occupy part or all of the ovary, and as many as five distinct and separate dermoids have been found in the same ovary. They are commonly intraperitoneal and are rarely found between the layers of the broad ligament. Both skin and mucous membrane are found in these cysts. The amount of skin found varies greatly. It may completely line a large cyst or may be confined to a single daughter cyst.

Foreign structures found in dermoids are hair, teeth, nails, horns, sebaceous and sudoriparous glands, mammæ, bone, unstriped muscle fiber, brain, and nerve tissue.

The hair may be rolled into a ball and lie free in the cyst cavity,

or tufts of hair may spring from the cyst wall. The hair has been known to be five feet in lengh (Munde). The color varies from blond to black, and does not usually correspond to the color of the patient's hair. It is known to turn gray in old age, and at this time the cyst may become bald.

The teeth may be embedded in bone, resembling a rudimentary jaw, or may be lodged in the fibrous wall of the cyst. More than 400 teeth have been found in a single dermoid cyst of the ovary. They represent teeth of every description, and develop on the same plan as teeth in the normal situation. They are not scattered irregularly through the cyst unless present in large numbers, but are grouped together. Nails and horns project from the surface of the cyst. Sebaceous and sweat glands may be numerous, and may form retention cysts. Bone, in shapeless masses or in plates, is occasionally found. Nerve matter has been detected in dermoid cysts.

Mammæ, in the form of a nipple attached to rounded projections of tissue containing sebaceous glands and more or less fat, are occasionally found, and completely formed glandular structures have been recognized. Dr. Desiderius reported a case in which a mammary gland in a sebaceous cyst secreted milk and colostrum.

Dermoid cysts of the ovary have occurred at all periods of life, from birth to eighty years of age, and are the most common abdominal tumor in girls and young women. The rate of growth varies from a few months to many years in attaining the maximum size. They are rarely larger than the patient's head, and may be self-limiting in their growth. As a rule, adhesions bind the cyst to the intestine. Suppuration and malignant degeneration are the peculiar characteristics of dermoid cysts of the ovary.

Connective-tissue New-formations.—Fibroma, myoma, myxoma, enchondroma, osteoma, angioma, lymphangioma.

Fibroma.—Of the connective-tissue tumors of the ovary, fibroma is the most frequent. They are found with about equal frequency between the ages of twenty and fifty, and have been met with as early as ten or as late as eighty years of age. Peterson[1] reports two of his own cases and reviews the literature of eighty-two cases. The largest number occurred between the ages of forty and fifty years. Peterson finds no marked menstrual irregularities in these cases. The growth is usually slow, but may be quite rapid. Pain was experienced in more than half of the cases. Ascites was present in about 40 per cent. of the cases. No satisfactory explanation is given for the occurrence of ascites. In 13 per cent. there were calcareous deposits in the tumors, and cystic spaces were common.

Orthmann classifies fibroids of the ovary as superficial and diffuse.

(*a*) *Superficial fibroids* are commonly small, rarely larger than a walnut. They are single or multiple, and sessile or pedunculated in their attachment to the tunica albuginea. Their consistency is firm,

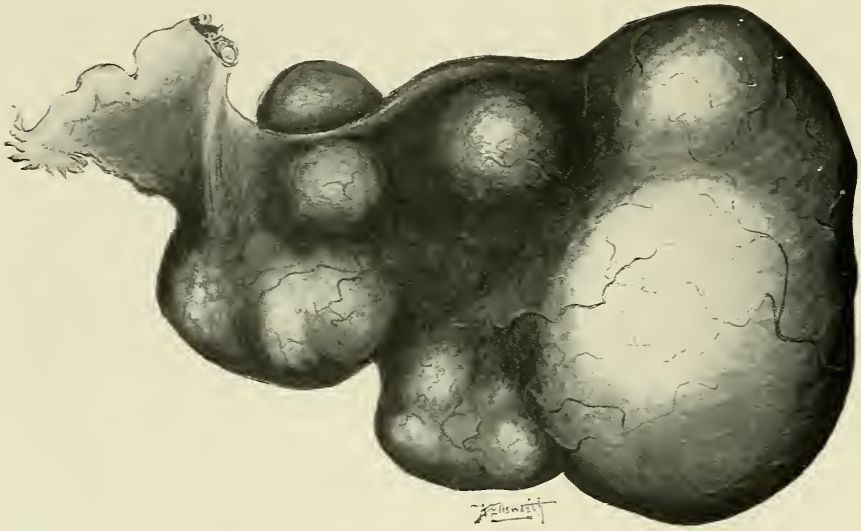
[1] American Gynecology, i, No. 1.

and the external surface is smooth or furrowed. On cross-section whorls and bands of fibers are seen. Germinal epithelium covers the surface of the tumor.

(*b*) *Diffuse fibroids* have rarely grown larger than a man's head. Clemens reported one weighing 40 kilos. The contour varies from round and smooth to irregular and nodular. The amount of blood supply is variable, and hence the color of the tumor varies from a pale green to a yellowish red. Unless there are degenerative changes their consistency is uniformly firm.

Adenofibroma of the ovary is an occasional finding and consists of glandular tissue in a fibrous framework.

FIG. 479



Fibroma of ovary. 13 x 11 x 10 centimeters. (Peterson.)

Myoma.—The origin of myoma of the ovary is probably in the muscle fibers of the vessel walls and the ovarian ligament. They are rare. None larger than a man's fist have been reported. In general appearance they closely resemble fibroids.

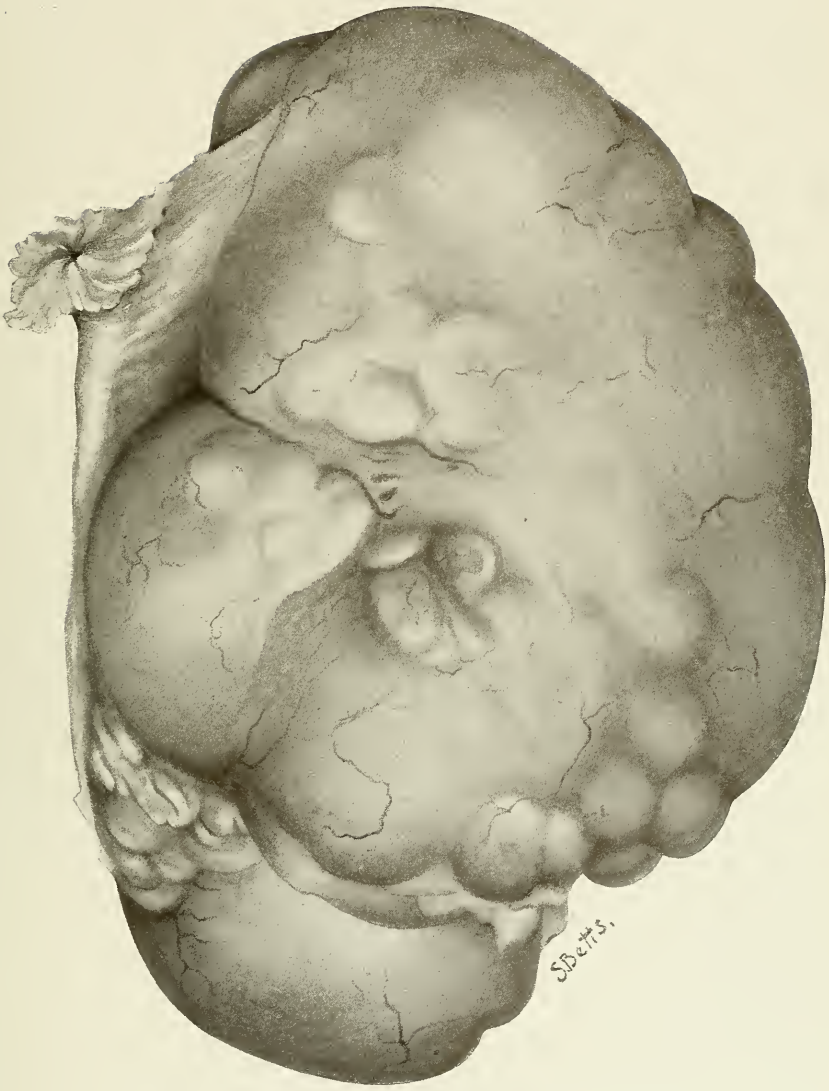
Myxoma.—Myxoma ovarii appears as a degenerative form of ovarian tumors, not as a primary growth.

Enchondroma and Osteoma.—Enchondroma and osteoma are secondary changes in preëxisting ovarian tumors.

Angioma and Lymphangioma.—Angioma and lymphangioma are extremely rare. A congenital angioma is described by Orth.

Sarcoma.—About 4 per cent. of ovarian tumors are sarcomatous. They occur with greatest frequency at the time of puberty and the menopause. In 66,190 malignant tumors of the ovary 96 were sarcomata. They are found at any period of life, from birth to old age. The periods

PLATE XXXVI



Endothelioma of the Ovary. (Hertzler.)

of puberty and the menopause are the most frequent (Zangemeister). Doran found a sarcoma of the ovary in a seven months' fetus. Heinrichs reported one in a woman, aged seventy-four years. According to Temesvary the average age of the patient is thirty-two years. Pfannenstiel found sarcoma of the ovary most frequent between the ages of twenty-one and thirty. In 25 cases Pick found 10 occurring before twenty years of age.

Primary sarcoma of the ovary is usually unilateral, while secondary sarcoma is usually bilateral. The round-cell variety grows rapidly and early gives rise to metastasis, while spindle-cell growths slowly reach a large size without metastasis. Sutton says sarcoma of the ovary differs from sarcoma found elsewhere in that both ovaries are often simultaneously affected. In 121 cases in the literature the author found 42, or about one-third of the number, in which both ovaries were involved.

Many so-called fibroids of the ovary are undoubtedly sarcomata. Russel and Shenck described a sarcoma springing from the theca interna. In form they may resemble a large ovary or are very irregular and nodular. Their consistency varies from firm to soft and the color from pale gray to reddish white. The rate of growth is variable, the softer tumors growing more rapidly. Chrobak saw a sarcoma of the ovary grow to the size of a five months' pregnancy in a few months.

The entire ovary is usually involved, and both ovaries are affected in about one-half of the cases.

Both round and spindle sarcoma cells compose the tumor. About one-third are cystic. Sarcomatous degeneration of dermoid cysts is described. Metastasis occurs later in sarcoma than in carcinoma of the ovary. Metastatic growths are found in order of frequency in the peritoneum, omentum, wall of the stomach, pleura, lungs, uterus, liver, diaphragm, retrovaginal connective tissue, mediastinum, tubes, intestines, and kidney (Temesvary).

A myxomatous degeneration of sarcomatous tissue is occasionally observed.

Ascites develops in 60 to 70 per cent. of cases. Uterine hemorrhage is not uncommon, even after the climacterium. When found in children there is often a premature development of the genitalia.

When the tumor is not removed, death results from rapid spread of the disease or from complications, such as obstruction of the bowel. Neighboring structures are attacked before those which are more remote. The order of frequency with which these organs are attacked is peritoneum, omentum, stomach, pleura, lungs, uterus, liver, diaphragm, and kidneys. Recurrence after removal of the primary growth occurs in 25 to 50 per cent. of cases.

Endothelioma.—Marchand and Leopold first observed malignant new-formations of the ovary arising from the endothelium of blood-vessels. They are also known to arise from the lymph vessels. Few have been recognized, but doubtless many pass for carcinoma and sarcoma.

Parovarian Cysts.—The parovarium consists of a series of tubules lying between the layers of the mesosalpinx. When the mesosalpinx is stretched and held between the eye and the light, the tubules are seen as narrow cords running in parallel lines from the hilum of the ovary to a longitudinal tubule lying parallel to the tube and immediately beneath it (Gärtner's duct). The tubules are lined with ciliated epithelium. The parovarium is homologous with the vasa afferentia and epididymis of the testis. It is composed of the persistent excretory ducts of the Wolffian body.

Fig. 480

Parovarian cyst. Between the tube and ovary is a thin-walled, transparent cyst the size of an almond. It lies between the layers of the broad ligament, and was developed from a parovarian tubule.

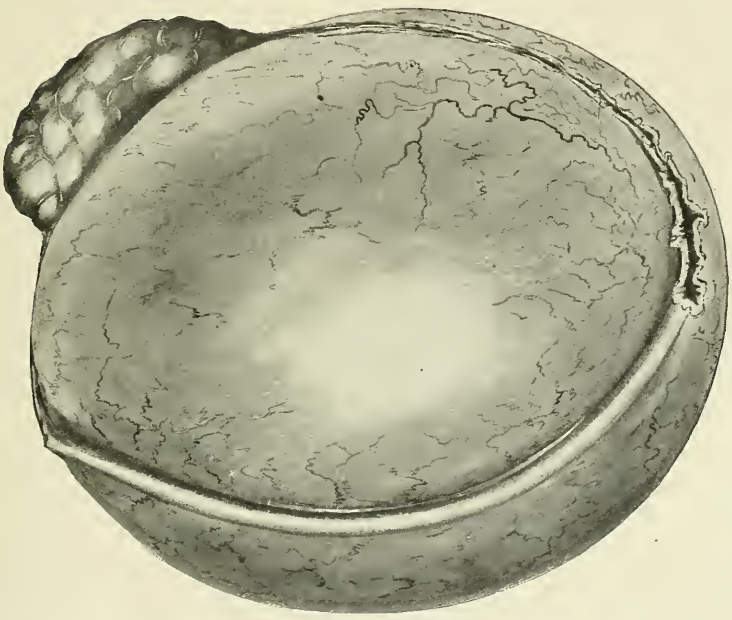
As a rule, there are twelve tubules. The tubule running parallel to the Fallopian tube and at right angles to the parovarian tubules is the duct of Gärtner, which in exceptional cases may be traced to the vagina.

Cysts arising from the parovarium, the so-called parovarian cysts, are of common occurrence. As the cyst develops the layers of the mesosalpinx are unfolded, the tube is crowded upward and runs over the cyst, and the ovary is crowded downward. The Fallopian tube is greatly elongated in large cysts, but the lumen is seldom obliterated. The wall of the cyst is at first thin and transparent, later thick and non-transparent. The epithelium lining the cyst is columnar and usually ciliated in the small cysts, while later the epithelium is stratified and flat. In the very large cysts the epithelium may wholly disappear through pressure. The fluid contents are clear and watery, the reaction is slightly alkaline, and the specific gravity 1002 to 1010.

No parovarian cyst has been recorded in an individual under sixteen years of age (Sutton). They are said to comprise about 10 per cent. of ovarian tumors. Parovarian tumors are rarely adherent; they seldom suppurate, and are less liable to axial rotation than are ovarian cysts, because they are usually fixed by the broad ligament and seldom have a pedicle.

The Clinical Diagnosis of New-formations of the Ovary.—In the diagnosis of ovarian tumors it is of the greatest importance to recognize a pedicle connecting the tumor to the horn of the uterus. The pedicle is composed of the Fallopian tube, broad ligament, and ovarian ligament. A short, thick pedicle holds the tumor close to the uterus, while a long, slender pedicle permits considerable separation. The length and thickness of the pedicle are not proportionate to the size of the tumor. When, as occasionally happens, the tumor grows in the direction of the mesovarium and broad ligament it becomes intraligamentous. An ovarian tumor may be partly within the broad ligament and partly

FIG. 481



Parovarian cyst. The cyst is almost round, the wall is thin and transparent. There is but a single cavity containing a watery fluid of low specific gravity. Covering the cyst is a thin, vascular membrane which appears to form a part of the cyst wall. The vascularity of the cyst wall is a characteristic feature. The Fallopian tube is stretched over the cyst, and the ovary is crowded to the side.

within the free peritoneal cavity. Having grown between the layers of the broad ligament, the tumor may burrow to the left behind the sigmoid flexure, to the right behind the cecum, into the parametric tissue behind the uterus, or between the bladder and abdominal wall underneath the peritoneum.

In discussing the diagnosis of ovarian tumors we will adopt the classification of Winter, devised by him for convenience of description. It is as follows:

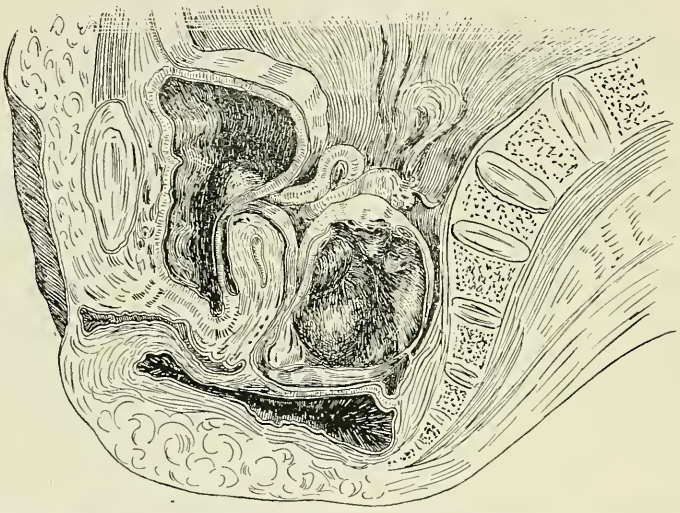
1. Small ovarian tumors, which lie wholly or in part within the pelvis.

2. Medium-sized ovarian tumors, which have grown into the abdominal cavity, which have not grown beyond the size of a man's head, and have not risen to the arch of the ribs.

3. Large ovarian tumors, which rise to the arch of the ribs and are in intimate relation to the liver, kidney, and spleen.

The Diagnosis of Small Ovarian Tumors Which Lie Wholly or in Part within the Pelvis.—The tumor may be closely crowded to the uterus—so close that no pedicle is detected. It is always possible in a vaginal examination to insert the finger between the supravaginal portion of the cervix and the tumor. When the tumor lies behind the uterus it is especially difficult to separately outline the two. Ovarian cysts are round, the surface is usually smooth, and fluctuation is well-marked.

Fig. 482



Ovarian cyst on cross-section, located behind the uterus. Uterus crowded against the bladder.

They are not tender to pressure unless complicated by adhesions or other inflammatory lesions.

Solid tumors are usually more uneven in outline and have a firm consistency. Cystic tumors, with thick walls and surrounded by an inflammatory exudate, may give the impression of solid tumor growths. The uterus may be crowded to the opposite side.

Differential Diagnosis.—To diagnosticate small tumors of the ovary from cystic degeneration, chronic ovaritis, hematoma, and abscess, it is necessary to consider the history of the onset and the clinical course. Sensitiveness to pressure speaks for inflammatory enlargements, as does fixation. Inflammatory enlargements of the ovary do not show steady growth as do new-formations, and, furthermore, they are more likely to be bilateral. In inflammatory swellings of the ovary, the accompanying tube is often diseased, and evidences of

pelvic peritonitis are frequently found. The effect of local applications is to reduce the size of inflammatory swellings of the ovary, while such treatments have no effect upon new-growths.

Cystic Degeneration of the Ovary.—Cystic degeneration of the ovary is usually associated with chronic ovaritis, and is to be distinguished from new-formations of the ovary by the small size and by the tendency to self-limitation in growth. Such ovaries are rarely larger than a hen's egg.

Uterine Fibroids.—It is easy to mistake pedunculated subperitoneal fibroids of the uterus for tumors of the ovary.

Uterine Fibroids	Ovarian Cysts
1. Rarely occur in early life.	1. May occur in infancy.
2. Rarely grow after the menopause.	2. Often continue to grow after the menopause.
3. Rate of growth is slow.	3. Rate of growth is usually more rapid.
4. Consistency usually firm.	4. Fluctuating.
5. Intimately attached to the uterus.	5. Less intimately associated with the uterus.
6. Tumor may be attached to any portion of the uterus.	6. Tumor connected with the uterine horn.
7. Pedicle usually short and thick.	7. Pedicle may be long and slender.
8. Uterus usually increased in length.	8. No increase in the length of the uterus.
9. May find both ovaries normal.	9. One or both ovaries abnormal.
10. Venous murmur heard in 50 per cent. of large fibroids.	10. Venous murmur seldom heard.
11. Menorrhagia common.	11. Not common.
12. Functions of the bladder and rectum often disturbed.	12. Not often disturbed.

It must be remembered that uterine fibroids may appear to fluctuate similarly to a cyst with gelatinous fluid. When doubt exists, after all of the above points are considered, an exploratory incision should be made.

Tubal Pregnancy.—(See Chapter IX.)

Serous Perimetric Exudates.—Serous periometric exudates may become sharply circumscribed, slightly or not at all tender to pressure, and may fluctuate from contained fluid. In the early stage the exudate may collect in the pouch of Douglas, and from its form and consistency it may be mistaken for an ovarian tumor. Such exudates are rounded below and flat above, while ovarian cysts are round throughout their entire circumference. The consistency may show variations at different points, while in ovarian cysts the consistency is usually uniform throughout. The exudate blends with the surrounding structures, and is inseparably connected with the uterus.

The history of infection, the rapid development of the mass, and the tendency to remain stationary, or to decrease in size, are important factors in the differential diagnosis of perimetric exudates from ovarian cysts.

Parametric Exudates.—Parametric exudates can usually be differentiated from ovarian cysts by the history of infection. This will point to an inflammatory origin. The location of the mass in the connective tissue, in close proximity to the vaginal wall, is characteristic of pelvic cellulitis. Ovarian tumors lie on a higher level. The consistency of

an inflammatory exudate changes from time to time, becoming firmer and irregular, while the consistency of ovarian cysts is constant. It is often possible to palpate both ovaries apart from the pelvic exudate.

The intimate connection with the uterus, the ill-defined outline, the immobility and tenderness to pressure, the history of infection, and the sudden development of the mass, together with its tendency to become smaller as time goes on, are significant points in favor of the diagnosis of a pelvic exudate.

Pericecal Abscess.—A suppurating cyst of the ovary may be confused with an abscess about the cecum. A history of one or more attacks of appendicitis and existing intestinal disorders will be suggestive. The abscess is largely confined to the right iliac region, and extends downward to the uterus, rather than upward from the uterus.

Retro-uterine Hematocele.—Retro-uterine hematocele occupies the pouch of Douglas, and may be so moulded as to suggest an ovarian tumor. A hematocele is less tense and elastic, and does not fluctuate. There is no attachment by a pedicle to the horn of the uterus, and it may be possible to palpate both ovaries apart from the mass. A history of ruptured tubal pregnancy is often elicited. An exploratory puncture or incision will disclose the blood.

Intraligamentous hematoma, in its early development, occupies a position altogether impossible for an ovarian tumor, and, later, as it dissects around the uterus, it cannot be confounded with an ovarian tumor. The low situation of the mass, its ill-defined outline, the absence of fluctuation, its tendency to become smaller instead of progressively enlarging, and, finally, an exploratory puncture or incision will determine the diagnosis. There is usually a history of ectopic pregnancy with rupture of the gestation sac.

A retroflexed pregnant uterus has been mistaken for an ovarian cyst. The usual signs of pregnancy are to be considered. In ovarian cysts it is possible to have amenorrhea, enlargement of the mammæ, secretion of colostrum, discoloration of the cervix and vagina, and nausea. These signs, together with a rapidly growing abdominal tumor, will suggest pregnancy.

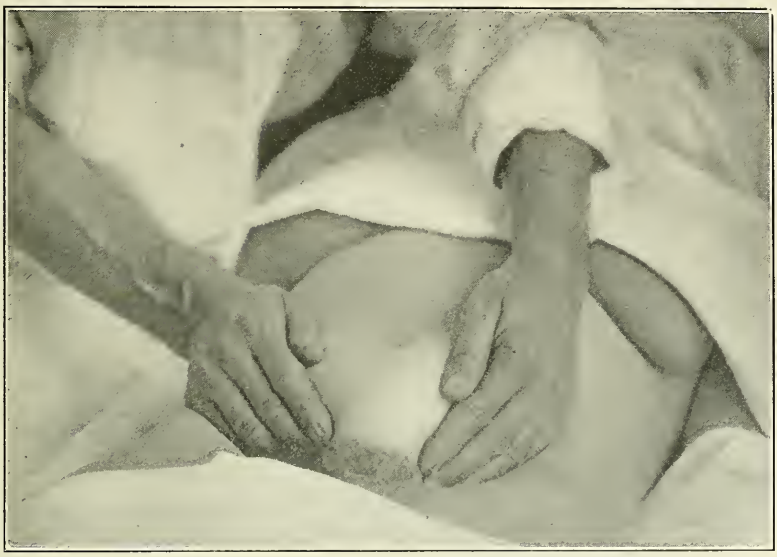
The rate of growth of a pregnant uterus is more rapid than that of an ovarian cyst. Its consistency is soft and elastic, as contrasted with the tense elasticity of an ovarian cyst. So long as there is a suspicion of pregnancy, the sound should not be employed. When in doubt as to the diagnosis, and immediate interference is not necessary, the patient should be kept under observation for several weeks to note the progress of the tumor and the development of positive signs of pregnancy.

The Diagnosis of Ovarian Tumors of Medium Size.—A tumor lying at the brim of the pelvis that is round or oval, sharply outlined and fluctuating, is in all probability an ovarian cyst. If it can be demonstrated that the tumor is attached to the horn of the uterus by a pedicle, the diagnosis is confirmed. It is most essential to recognize the pedicle, and this is usually possible when the conditions for examination are

favorable. When the pedicle is difficult to palpate, Hagar advises traction on the cervix by a tenaculum while a recto-abdominal examination is carried out.

Winter further advises traction on the tumor by an assistant, as shown in Plate X. In this manner the pedicle is made taut and can be more readily recognized. When the pedicle cannot be palpated the diagnosis must rest upon the consistency and general outline of the uterus.

Fig. 483



Elevating a pelvic tumor to demonstrate its origin in the pelvis.

Pregnancy in the second and third trimester can only be confounded with an ovarian tumor when there is no evidence of the presence of a fetus. There will be still greater uncertainty in the diagnosis when it is not possible to demonstrate the direct continuity of cervix and body, because of the high position of the uterus.

The uterine souffle is seldom heard in ovarian cysts.

Advanced Ectopic Pregnancy.—The history of pregnancy, together with the finding of an abdominal tumor of unequal, soft consistency and absence of fluctuation, will usually suffice for the exclusion of an ovarian cyst. When the fetus is living, it is scarcely possible to mistake the tumor for an ovarian cyst. With the death of the fetus all signs of pregnancy may disappear. The uterus in an ovarian cyst is normal in size, while in advanced ectopic pregnancy it fairly resembles a pregnant uterus at the third month.

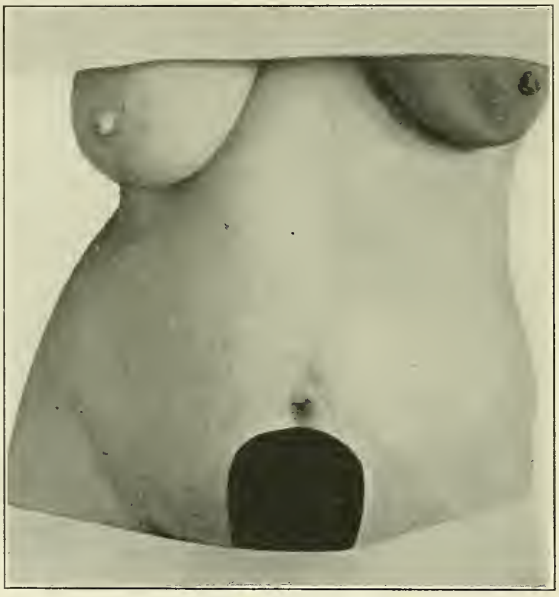
A distended bladder may resemble an ovarian cyst in general outline, position, and consistency. In every pelvic examination, for whatever lesion, it is always advisable to make sure that the bladder is empty. If this rule is observed there will be no question as to the differential

diagnosis of an ovarian cyst from a greatly distended bladder. When such a question arises the catheter will obviate all possible error (Fig. 484).

Tumors of the omentum rarely simulate ovarian tumors. They are seldom so sharply circumscribed and rounded, and are not attached to the uterus by a pedicle. The finding of the ovaries apart from the tumor will exclude the possibility of an ovarian tumor. Omental cysts have been tapped for ovarian cysts.

Echinococcus cysts of the pelvis form a rounded cystic tumor that closely resembles an ovarian cyst. The presence of a tumor of the liver denotes the presence of echinococci, but an absolute diagnosis is only made by an exploratory puncture and the finding of hooklets.

FIG. 484



Area of dulness in a distended bladder.

Parovarian cysts have thin walls and are less tense than ovarian cysts. Unless the ovary can be palpated distinct from the cyst, a clinical diagnosis cannot be made with certainty.

Phantom tumors of the abdominal wall, caused by muscular contraction and gas distention, may simulate an ovarian cyst in form and consistency. The swelling has no connection with the uterus and will disappear under anesthesia.

The Diagnosis of Large Ovarian Tumors Filling the Abdominal Cavity.—It is often impossible to palpate the pedicle because of the close proximity of the large tumor to the uterus. When it is demonstrated that the swelling is a cystic tumor and not free fluid, the diagnosis of an ovarian cyst is highly presumptive, because it is most unusual for a

cystic tumor of such size to grow from any other source than the ovary. The superficial veins of the abdominal wall are distended, and markings resembling striæ gravidarum are usually seen over the abdomen. The percussion note is dull over the swelling, and tympanitic in the flanks and over the stomach, when the intestine and stomach have been crowded by the tumor. Changing the position of the patient does not alter the outline of the area of dulness as it does in free ascites.

Fluctuation is easily demonstrated. Because of the great distention of the abdomen, it is difficult to outline the uterus. When pregnancy can be excluded the uterine sound will determine the position of the uterus. In cysts of extreme size the upper border lies beneath the sternum and ribs, bulging them forward; the tympanitic note of the transverse colon and stomach is lost. The splenic dulness also is lost, the liver dulness cannot be defined from that of the tumor, and the heart and lungs are pressed upward. The abdomen is symmetrically enlarged, hence measurements are of no value in the largest cysts. Those of smaller size present an asymmetrical enlargement which can be demonstrated by inspection and by certain measurements. These measurements are taken from the umbilicus to the anterior superior spine of the ilium, and from the linea alba to the spine of the vertebræ. A comparison of the measurements of the two sides will afford reliable information. Auscultation is of little service. A bruit is sometimes heard, and will serve to differentiate the cyst from ascites.

Differential Diagnosis.—*Free ascites* is often mistaken for large ovarian cysts. Cases occur in which a diagnosis cannot be made until the abdomen is opened. Still greater difficulty arises when an ovarian cyst is associated with ascites. Much can be ascertained from inspection of the distended abdomen.

Ascites	Large Ovarian Cyst
1. Diseases of the heart, lungs, liver, and peritoneum to account for the presence of the fluid.	1. Absent.
2. Rapid development.	2. Development usually slow.
3. Inspection of abdomen.	3. Inspection of abdomen.
(*a*) Enlargement symmetrical.	(*a*) Enlargement asymmetrical unless the entire abdomen is filled.
(*b*) Flattening anteriorly and bulging in the flanks with patient on her back.	(*b*) Round anteriorly and flat in the flanks with patient on her back.
(*c*) Lower portion of abdomen bulges and epigastrium is flattened with patient erect.	(*c*) No change in the outline of the tumor by change of position of patient.
(*d*) Navel prominent and thin.	(*d*) Navel not prominent.
(*e*) Costal arch does not bulge.	(*e*) Costal arch bulges.
4. Percussion of the abdomen.	4. Percussion of the abdomen.
(*a*) Dulness in flanks.	(*a*) Dulness over abdominal prominence.
(*b*) Tympany in median line.	(*b*) Tympany in flanks and epigastrium.
(*c*) Change of area of dulness by change of position of patient.	(*c*) No such change.
5. Palpation of abdomen.	5. Palpation of abdomen.
(*a*) No outline of tumor can be palpated.	(*a*) Outline palpated.
(*b*) Fluctuation in all vaginal fornices.	(*b*) More limited.
6. Exploratory puncture. Contains serous fluid.	6. Exploratory puncture. Contains serum or mucus
7. Hydragogues and diuretics temporarily improve the condition.	7. Have no effect.

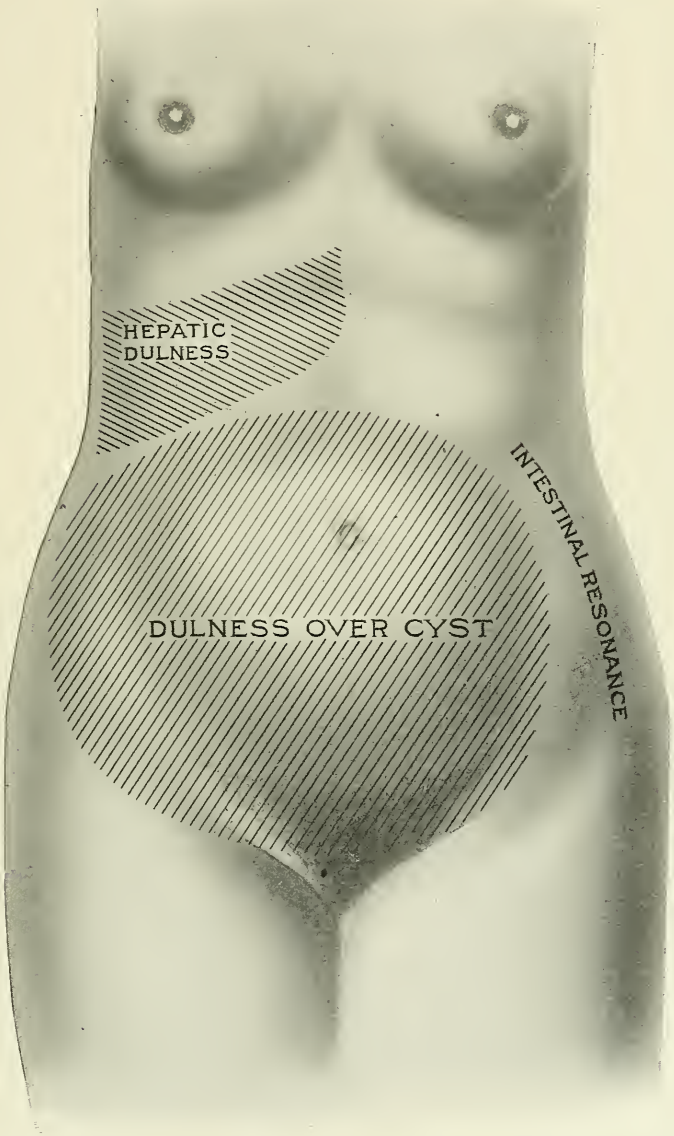
The percussion note is of greatest value in differentiating free from encysted fluid. The area of dulness increases as the fluid collects, and is last to disappear in the epigastrium. In ascites of extreme

FIG. 485

Free fluid in the abdominal cavity. The dark lines show the area of dulness on percussion, with the patient lying on her back.

grade there may be no area of tympany, and the same may be true of very large ovarian cysts. If the mesentery is short, the tympanitic note disappears early; if long, so as to permit the bowels to float on

FIG. 486



Large ovarian cyst. The dark lines show the area of dulness on percussion in any position the patient may assume.

the surface of the ascitic fluid, or to be crowded in advance of the cyst, the tympany can be demonstrated until the abdomen is overdistended.

Certain fallacies must be guarded against. A short mesentery or the presence of adhesions may confine the intestine to the flanks in free ascites and give a tympanitic note in this region. In ovarian cyst the bowel may be adherent to the anterior abdominal wall and give a tympanitic note in the median line. Gas generated within the cyst may give a tympanitic note. Again, the absence of gas within the bowel may give a dull note when tympany would otherwise be found.

In an ovarian cyst the percussion note is always dull over the tumor, whether the percussion is superficial or deep, while in ascites superficial percussion may be tympanitic and deep percussion dull.

It is especially difficult to differentiate between ascites and a thin-walled cyst, such as a large parovarian cyst. In the latter the fluid may gravitate to the dependent portions of the abdomen, and it may not be possible to outline the tumor by palpation. An exploratory incision may alone clear up the diagnosis.

As an aid to the differential diagnosis of ascites and ovarian cysts, Landau advises putting the patient in the lithotomy position and elevating the hips. If there is a large quantity of free fluid in the abdominal cavity, the uterus, in an abdominovaginal manipulation, may be demonstrated to lie upon a water-cushion.

Pancreatic Cysts.—No confusion should arise in the early development of pancreatic cysts. They take their origin in the region of the pancreas and grow from above downward. The most prominent portion of the tumor is located in the region of the navel.

It is possible for a small or moderate-sized ovarian cyst with a long pedicle to occupy a similar position. Such a cyst is usually more movable than a pancreatic cyst, and the demonstration of its attachment to the uterus by a pedicle will determine the diagnosis.

In doubtful cases an exploratory puncture, together with a chemical analysis of the aspirated fluid, will identify a pancreatic cyst. The danger of perforating the stomach is to be borne in mind.

Splenic Tumor.—It is possible for a tumor of the spleen to extend to the inlet of the pelvis, and when cystic (echinococcus), an ovarian cyst may be diagnosticated. Most splenic tumors are solid, and these are not likely to be mistaken for ovarian tumors. A splenic tumor grows from above downward, while an ovarian tumor grows from below upward. The finding of a pedicle connecting the tumor with the horn of the uterus identifies it as ovarian in origin. An analysis of the blood will often disclose the nature of a splenic tumor (splenic leukemia, malaria). The notched border and the respiratory movements of the spleen are significant. A number of cases have been reported in which the spleen of about normal size has occupied the pelvis and has been mistaken for solid tumors of the ovary. It is important in all such cases to seek for a pedicle connecting the tumor with the horn of the uterus. As a last resort an exploratory incision may be made.

Tumors of the Liver.—It is possible for tumors of the liver to reach to the inlet of the pelvis. An ovarian tumor, because of its great size or long pedicle, may reach to the right costal arch and the tumor and liver become one inseparable mass.

A uniform enlargement of the liver should be recognized by its sharp lower border and by the characteristic fissure separating the right from the left lobe. The mass should move with respiration, a fact not observed in ovarian tumors. An irregular enlargement of the liver, as from echinococcus cysts, abscess, and new-formations, is more likely to be mistaken for an ovarian tumor than is a uniform enlargement. Here, as at all times, it is essential to determine the relation of the tumor to the uterus, whether or not the tumor is attached to the horn of the uterus by a pedicle. In pedunculated tumors of the liver the greatest mobility is at the lower portion of the growth, while in freely movable ovarian tumors the greatest mobility is at the upper portion of the tumor.

Fatty Tumors.—Enormous fatty tumors may spring from the omentum and subserous tissue, and suggest the possible presence of ovarian tumors. Fatty tumors do not fluctuate and are not attached to the horn of the uterus by a pedicle.

A distended gall-bladder containing eleven pints of fluid was operated upon by Lawson Tait, who mistook it for an ovarian cyst.

A chylous cyst of the mesentery may attain an enormous size, and closely simulate an ovarian cyst.

Obesity.—A thick abdominal wall may suggest the presence of an ovarian tumor. It may be impossible to say that an ovarian cyst does not exist without making an exploratory incision.

Allantoic or urachus cysts may give rise to suspicion of an ovarian cyst. They may attain a large size, and are always found in the median line between the abdominal wall and peritoneum.

Hydronephrosis has been mistaken for ovarian cysts. A hydronephrosis may occupy the pelvis and an ovarian tumor may occupy the region of the kidney. Moreover, a hydronephrosis and an ovarian tumor may coexist.

The characteristic physical signs of renal tumors can usually be relied upon. The colon lying over the kidney gives a tympanitic note on light percussion. In exceptional cases the bowel may lie in front of an ovarian cyst. In hydronephrosis the tumor usually varies in size from time to time, and the diminution in size is accompanied by an abundant flow of urine. Examination of the urine may disclose important facts. It is possible for an ovarian cyst to rupture, and this in turn be followed by diuresis. Hydronephrosis is rarely so movable as an ovarian cyst. The ovarian cyst when large and fixed may cause hydronephrosis by pressure upon the kidney or ureter.

The diagnosis of *bilateral ovarian tumors* is readily made when, from either tumor, a pedicle is traced to the uterine horns. The smaller the tumor, the easier the diagnosis. In large tumors the diagnosis may be impossible. When in the absence of pregnancy and in the

presence of a large cystic tumor of the abdomen, the menses are suppressed, a bilateral ovarian tumor is suspected. The two tumors are rarely of the same size, and seldom lie on the same level. A furrow may separate the two, and two separate and distinct percussion waves may be elicited. The tumors may be moved separately by bimanual manipulation. An examination under anesthesia will be of special value in outlining one cyst from the other. Not infrequently the diagnosis is deferred until an exploratory incision has been made.

Intraligamentous Development of Ovarian Tumors.—It is not always possible to recognize an intraligamentous tumor of the ovary without opening the abdomen. Such tumors lie within the two layers of the broad ligament in close proximity to the uterus and are usually firmly fixed. No pedicle can be palpated. In very exceptional cases the tumor will distend the broad ligament and draw it out into a broad pedicle. Such tumors have some degree of mobility. Intraligamentous tumors of the ovary rarely grow to a large size. The uterus and tumor appear as one mass, or the uterus may be distinctly outlined from the tumor. In exceptional cases the tumor may burrow beneath the peritoneum, behind or to the front of the uterus. When bilateral the uterus may be lifted out of the pelvis.

Ovarian Cysts	Parovarian Cysts
1. Develop from the oöphoron.	1. Develop from the parovarium.
2. Commonly multilocular.	2. Usually unilocular.
3. May reach enormous size.	3. Seldom large.
4. Growth usually rapid.	4. Usually slow.
5. Usually pedunculated and movable.	5. Rarely pedunculated and usually fixed.
6. Adhesions about cyst common.	6. Adhesions not common.
7. Tapping not curative.	7. Often curative.
8. Character of contents: contains albumin; is mucinous or thin and watery; clear and transparent, or coffee colored.	8. Character of contents: little or no albumin; clear, watery fluid of sp. gr. 1.003 to 1.010.
9. Papillomatous growths common.	9. Not common.
10. Rarely intraligamentous.	10. Always.
11. Tendency to become malignant.	11. Seldom becomes malignant.
12. Rarely self-limited in growth.	12. Self-limited in growth.
13. No ovary visible.	13. Ovary attached to the periphery of cyst.
14. Bloodvessels seldom seen to radiate over the surface of the cyst.	14. Large, radiating bloodvessels frequently seen on the surface of the cyst.

Adherent Tumors of the Ovary.—From an operative point of view it is important to recognize the presence of adhesions. It is manifestly more difficult to recognize adhesions in large cysts, which have little or no range of motion, than in small cysts which, under ordinary conditions, are freely movable. Adhesions are recognized by the immobility of the tumor, its greater or less degree of tenderness, and, in exceptional cases, by palpating the adhesions in a conjoined examination.

In large cysts the respiratory excursions are less marked when adhesions are present. It may be impossible to determine the degree of mobility unless an anesthetic is administered. When the cyst is adherent to the parietal peritoneum the abdominal wall moves with the cyst; friction sounds and fremitus may be heard. Adhesions to

the mesentery and intestine may permit free mobility of the tumor. Not infrequently adhesions are recognized only after the abdomen is opened.

Torsion of the Pedicle.—It is of the greatest importance to make an early diagnosis of torsion of the pedicle. Delay in recognizing the condition may result disastrously.

Certain conditions are recognized as predisposing to this event, namely, a long pedicle, ascitic fluid, sudden alterations in the intra-abdominal pressure from overexertion, falls, and blows, a growing pregnant uterus, and the emptying of a pregnant uterus. Torsion of the pedicle is said to occur in about 10 per cent. of ovarian and parovarian tumors.

FIG. 487

Right ovarian cystoma, with acute torsion of Fallopian tube and mesosalpinx, complicating a six months' pregnancy (one-half life size). (Marshall.)

When both ovaries are cystic, the liability to torsion is about as great as with a single cyst.

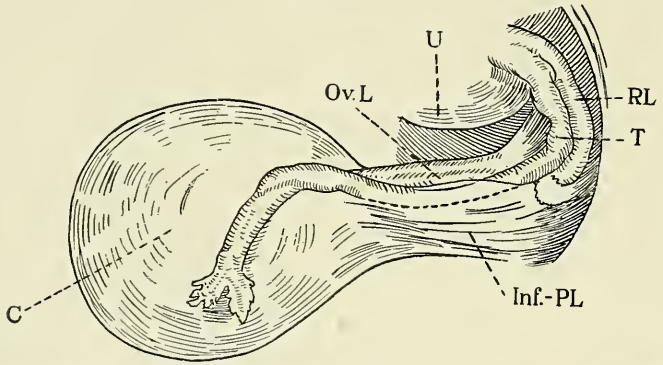
Twisting of the pedicle occurs in all ages and in all kinds of ovarian tumors. Thornton observed it in a thirteen-year-old girl, and Potter in a woman, aged eighty-three years. Dermoid cysts are particularly liable to this accident.

As a result of torsion of the pedicle, many grave complications may arise. Hemorrhage into the cavity of the cyst may rapidly distend it, even to the point of bursting, and may prove fatal. Gangrene of the cyst will rapidly follow when the circulation is completely shut off; peritonitis is then inevitable. If adhesions convey sufficient blood

to the cyst, gangrene will not follow and the cyst may remain intact. It is possible for the cyst to be entirely severed from the uterus. In order that the cyst may not undergo speedy destruction, adhesions must convey a sufficient supply of blood. The tightness of the twist varies with the thickness of the pedicle. Tumors of medium size are most liable to this accident (Fig. 487).

The diagnosis cannot be made with certainty. Having previously recognized a pedunculated tumor of the ovary, torsion of the pedicle will be suspected, when the patient is seized with severe pain in the region of the tumor, and at the same time the tumor increases in size and is tender to pressure. Collapse may follow immediately upon the twisting of the pedicle. An absolute diagnosis must be reserved for an exploratory incision. Operative interference must be advised upon a provisional diagnosis: the expectant plan of treatment should not be followed.

FIG. 488



Structures which go to make up the pedicle of an ovarian cyst. *RL*, round ligament; *T*, tube; *Ov.L*, ovarian ligament; *Inf.-PL*, infundibulopelvic ligament.

A limited degree of torsion may cause no symptoms; there is pain of variable intensity followed by symptoms of peritonitis, including fever, rapid pulse, tympany, and abdominal tenderness. Peritonitis complicating ovarian cysts is most often the result of secondary infection of the cyst. Torsion of the pedicle of an ovarian tumor must be differentiated from hepatic colic, renal colic, intestinal obstruction, strangulated hernia, appendicitis, ruptured tubal pregnancy, and rupture of a sactosalpinx.

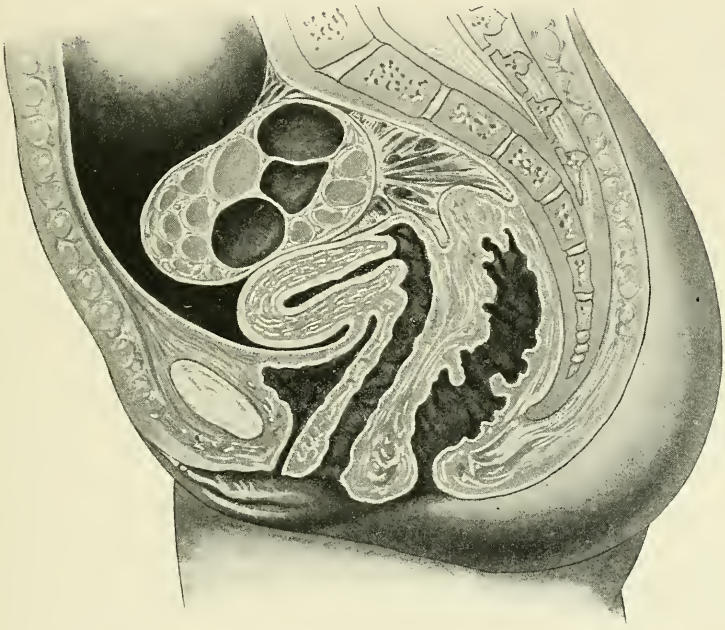
Rupture of an ovarian cyst results from direct violence, torsion of the pedicle, degeneration of the cyst wall, and hemorrhage within the cyst and in the wall of the cyst. Spontaneous rupture from thinning of the cyst wall has been reported.

When the cyst ruptures there is a feeling of relief from pressure; the cyst is no longer in evidence, but if sufficient fluid has escaped, the contents may be recognized free in the abdominal cavity. From absorption of the contained fluid the temperature may be slightly

elevated and the bowels and kidneys become unusually active. The cyst may rapidly refill. Again, it may fail to refill and in this manner a spontaneous cure is effected.

Leakage of the cyst is a term implying a slow and limited emptying of a cyst into the peritoneal cavity. The daughter cysts, which so often bulge on the surface of the parent cyst, have an extremely thin wall, which may give way at some point and permit the contents to be discharged into the peritoneal cavity. Secondary cysts also rupture into the parent cyst, and in this manner a multilocular cyst may be converted into a unilocular cyst.

FIG. 489



An adherent multilocular cyst crowding the uterus into extreme anteversion.

Rupture of the cyst may occasion hemorrhage that is either confined within the cyst or escapes into the free peritoneal cavity. The hemorrhage may prove fatal; this is particularly true of rupture following upon torsion of the pedicle. The escape of the fluid from the cyst is often hindered by the plugging of the rent with a daughter cyst.

Rupture of an ovarian cyst into hollow viscera is possible. Dermoid cysts are particularly liable to adhere to the bowel and to subsequently rupture into it; such cysts are invariably infected.

Hemorrhage into the cyst is the common result of torsion of the pedicle, and the symptoms are usually masked by those caused by the torsion. Puncture and direct violence are additional causes of hemorrhage. A moderate hemorrhage may cause no clinical symptoms. When

the loss of blood is considerable the symptoms are those of internal hemorrhage, together with a rapid increase in the size of the tumor, pain, and high tension in the cyst.

Suppuration of an ovarian cyst was formerly believed to follow tapping and the accidental admission of air. This is possible, but more often suppuration occurs independent of such events. Dermoid cysts are particularly liable to suppurate. The infected cysts are invariably adherent to the bowel, bladder, or vagina, and through these adhesions the infection is conveyed to the cyst.

In acute cases the patient dies from septic infection, unless operative interference is instituted. The symptoms of acute suppuration are characteristic. The temperature is elevated and irregular, the pulse is rapid and feeble, exhaustion and emaciation rapidly develop. The cyst increases in size, and is very tender to pressure. Sutton has observed the temperature to become subnormal in long-standing cases with foul-smelling pus contained within the cyst.

When gas generates in the cyst the dull percussion note gives place to tympany. After suppuration the cyst may discharge its contents into the bowel, bladder, vagina, rectum, peritoneal cavity, or through the abdominal wall.

When a fistulous communication is established between the cyst and a hollow viscus, the discharge of pus may be prolonged indefinitely, and the patient finally become exhausted. Fragments of bone, teeth, and hair have sloughed into the bladder from an adherent dermoid cyst. These fragments may become the nuclei of vesical calculi.

It is most unusual for such fistulæ to close spontaneously. The infection frequently travels to the cyst by way of the Fallopian tube. From an infected tube, adhesions may develop between the cyst and the omentum, bowel, bladder, and abdominal wall. In a similar manner the appendix is the starting point of an infection in and about the cyst. Adhesions between the appendix and cyst must be looked for in the course of the removal of the cyst, otherwise death may be caused by tearing through the appendix and bowel.

The Diagnosis of Malignant Degeneration of an Ovarian Tumor is of the utmost importance, but unfortunately cannot be made with certainty without a microscopic examination.

Bilateral ovarian tumors of the ovary are often malignant, but all forms of benign tumors of the ovary are occasionally bilateral. The presence of ascites is also suggestive of malignancy, yet malignant tumors of the ovary may exist without ascites, and all forms of new-growths of the ovary may be associated with ascites; this is particularly true of papillomatous growths.

The most suggestive signs of malignant degeneration of newgrowths of the ovary are rapid growth, immobility of the tumor, and their firm, nodular character. Partial development within the broad ligament is also said to be suggestive of malignant degeneration. Metastatic growths may be found on the peritoneum and in the viscera. Finally, an exploratory incision will be required in many cases, and even then

the diagnosis must sometimes be deferred for a microscopic examination. The consideration of the age of the patient is not of great importance in that malignant tumors of the ovary are found in all ages from the time of puberty.

Ovarian Tumors Complicating Pregnancy.—All forms of ovarian tumors may complicate pregnancy. Probably the most frequent are the dermoids, because they occur early in life, grow slowly, and are often fixed in the pelvis, where they offer obstruction to labor.

The dangers to be apprehended during pregnancy are:

1. Axial rotation of the tumor.
2. Rupture of the cyst.
3. Incarceration of the tumor in the pelvis.
4. Impediment to respiration when large.
5. Interference with the functions of the abdominal viscera from pressure.

The dangers to be apprehended in labor are:

1. Rupture of the cyst.
2. Torsion of the pedicle.
3. Suppuration of the cyst.
4. Hemorrhage into the cyst.
5. Rupture of the uterus and vagina.
6. Interference with the passage of the fetus and with contraction of the uterus in the third stage.

Pregnancy and labor are not often affected by the presence of an ovarian cyst.

The diagnosis of the variety of ovarian tumors is only possible to a limited degree. The diagnosis between a cystic and solid tumor is seldom difficult. Fluctuation and an exploratory puncture will demonstrate the presence of fluid.

It is almost impossible to clinically differentiate a unilocular from a multilocular cyst. When smooth and regular in outline and consistency, the cyst is assumed to be unilocular; when nodular and irregular in consistency, and when of enormous size, it is assumed to be multilocular. A positive statement can only be made when the cyst is opened.

Dermoid cysts are suspected when a slow-growing tumor, irregular in outline and consistency, is observed early in life.

Papillary cysts are suspected when the newgrowths of the ovary are bilateral or intraligamentous, when ascites accompanies them, and when they are irregular in outline.

Exploratory puncture of ovarian cysts was at one time universally employed, not only as a diagnostic measure, but for the purpose of emptying the cyst. The procedure has given way to the more satisfactory and equally safe method of exploratory incision. The fluid removed by aspirating may be so characteristic as to permit a diagnosis not only of the presence of an ovarian cyst, but of the particular variety. Mucinous fluid is characteristic of a pseudomucinous multilocular cyst of the ovary. The serous fluid of an ovarian cyst cannot be recognized from that of ascites.

Contrary to former belief, chemical and microscopic analyses are of no special value in differentiating the serous contents of ovarian cysts from ascites. The dangers involved in an exploratory puncture of a cyst are infection of the contents, puncture of a bloodvessel followed by alarming hemorrhage, injury to adherent coils of bowel, escape of the contents of the cyst into the peritoneal cavity, and finally, though rarely, torsion of the pedicle.

Exploratory incision may be regarded as a safer and more satisfactory method. The incision is to be made after the usual preparation for an abdominal section.

Fate of Ovarian Tumors.—1. Parovarian cysts are self-limiting in their growth, and if they rupture it is possible that they will never refill.

2. Ovarian cysts may disappear after rupture and torsion of the pedicle, though this is exceptional.

3. Simple cysts of the ovary are self-limited in their growth, but multilocular, proliferating cysts are not. According to Olshausen, proliferating, multilocular cysts will cause death from pressure within three years.

4. Proliferating cysts of the ovary cause death by:

(*a*) Exhaustion due to interference with nutrition, sleep, and breathing.

(*b*) Cystitis and pyelitis.

(*c*) Pressure on the ureters, causing hydronephrosis, pyonephrosis, and uremia.

(*d*) Intestinal obstruction.

(*e*) Suppuration and gangrene of the cyst.

(*f*) Peritonitis.

(*g*) Hemorrhage.

(*h*) Impediment to labor.

Ovariotomy.—Indications.—The rule should be adopted to *remove all ovarian tumors when the general condition of the individual will permit.* There are so many hazards to encounter in the life history of ovarian tumors that it is safer to remove them in their early stage than to await possible complications with their attending dangers. The following is a brief consideration of these complications from the standpoint of surgical intervention

1. *Malignant Degeneration.*—It is impossible to recognize malignancy in an ovarian tumor in the early stages of its development. The rapidity of growth, age of the patient, size of the tumor, general condition of the patient, presence or absence of ascitic fluid; these items are worthy of consideration, yet the malignant character of the growth may be unsuspected because of the absence of these suggestive clinical signs. *The only safe rule is to operate all ovarian tumors as early as possible.*

2. *Torsion of the Pedicle.*—According to Sutton about 10 per cent. of ovarian and parovarian tumors are subject to rotation, with twisting of the pedicle. The experience of authors differs widely: Spencer Wells had 12 cases in 500 ovariotomies; Thornton, 9.5 per cent.; Olshausen, 6.5 per cent.; Findley, 10.2 per cent.

As a result of twisting of the pedicle there is pain, more or less severe, even to producing collapse, hemorrhage into the cyst wall and into its cavity, rupture of the cyst into the peritoneal cavity, with escape of its contents, together with an amount of blood that may be sufficient to cause death, and finally the cyst wall may become gangrenous and death ensue from septic peritonitis.

Because of the frequency with which twisting of the pedicle occurs and the serious consequences of this event, we are justified in laying down the dictum that every ovarian tumor should be operated without unnecessary delay.

3. *Suppuration.*—Dermoid cysts are particularly liable to infection and the development of abscess formation, and this is true, to a lesser degree, of all ovarian tumors. And, as a result, the infection may become generalized or invade neighboring tissues, and fistulous tracts may be established with the bowel, bladder, vagina, and abdominal wall. Such a complication adds greatly to the dangers involved in the removal of the cyst and mitigates against a perfect recovery.

4. *Adhesions.*—Ovariotomy, in the presence of extensive adhesions, is a source of anxiety to the operator. Adhesions would seldom be encountered if all ovarian tumors were operated upon early in their development.

5. *Rupture of the Cyst.*—Rupture of the cyst is the result of violence, of thinning of the cyst wall from the pressure of its contents, and of twisting of the pedicle. This accident would likewise be largely eliminated by early operative interference.

6. *Functional and Organic Changes in the Abdominal and Thoracic Viscera Result from Pressure of the Tumor.*—No tumor should be permitted to reach a size that would permit of such complications.

Contra-indications to Operation.—Few contra-indications are recognized for the removal of large ovarian tumors or those which have developed serious complications. More conservatism may be entertained in the management of small, uncomplicated tumors. General debility, an incompetent heart, advanced anemia, nephritis, inflammatory lesions of the air passages, these and other possible conditions may forestall, for a time at least, the removal of ovarian tumors when uncomplicated, or not of such size as to cause serious pressure symptoms. When serious complications exist, or the tumor is of such size as to be no longer tenable, the conscientious surgeon will not hesitate to attempt its removal.

Age is no barrier to surgical interference. Statistics gathered by Kelly and Sherwood on ovariotomy in the aged and by Sutton in the young, show a remarkably favorable outcome of these cases in the extremes of life.

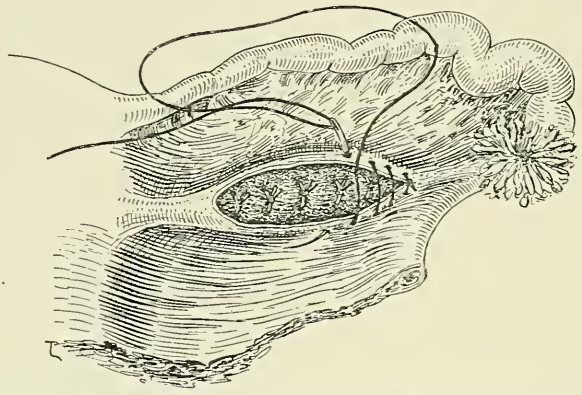
Vaginal Ovariotomy.—The first vaginal ovariotomy was performed by Atlee in 1854, but the practical application of the procedure was made by Gaillard Thomas in 1870; then followed Baker, Martin, Leopold, Battey, and Wing. The operation did not find general favor,

but it may be said that at no time has it been so generally accepted as in the present decade.

It is possible to deliver tumors of the ovary when not larger than a man's fist and of much larger size when not adherent, and when they can be first emptied of their contents, either through an anterior or posterior colpoceliotomy. Operators differ in their choice of the two methods of procedure. Greater space is afforded by the anterior route, and this is generally conceded to be the avenue of choice.

In the Tübingen clinic 24 per cent. of ovarian tumors were removed per vaginam. In 230 vaginal ovariotomies performed by Abel, Martin, Schauta, and Bumm there were but 2 deaths.

FIG. 490



Ovariotomy. The ovary is severed at the hilum. Interrupted sutures of catgut are placed at the base to control bleeding-points, and a continuous suture of catgut approximates the peritoneal margins.

In order that the tumor may be delivered *in toto* through the vaginal incision, it must be no larger than a man's fist, or when larger it must be free of adhesions and capable of being emptied through a trocar. When these conditions are present the size of the tumor does not enter into consideration. It must be borne in mind, however, that the large cysts are commonly multilocular, and frequently contain much solid tissue which would be difficult, if not impossible, to deliver through a vaginal incision. When there is suspicion of malignancy, and in all papillary tumors, the abdominal route should be chosen.

Technic of Posterior Colpoceliotomy.—For the removal of ovarian tumors through the posterior vaginal incision, the posterior lip of the cervix is grasped by a tenaculum forceps and traction toward the symphysis is made by an assistant. A transverse incision is made with sharp-pointed scissors back of the cervix. This incision is about one inch in length and extends only through the vaginal wall. The finger then burrows up to the peritoneal fold, which forms the floor of the pouch of Douglas; this is incised with scissors and spread open laterally with the fingers. If the ovarian tumor lies in the cul-de-sac, it can then be exposed by a Simon speculum. If the tumor is small and solid, it may be

grasped by a tenaculum forceps and delivered into the vagina; if large and cystic, it is grasped by tenaculum forceps and into it is thrust a long trocar, through which the fluid is withdrawn. As the cyst collapses it is grasped by long hemostatic forceps and withdrawn through the vagina. Ordinarily the pedicle will be long enough to permit of the delivery of the tumor, leaving the uterus within the pelvic cavity, but if not, the uterus may be delivered through the vaginal incision. The pedicle is then ligated and incised as in abdominal ovariotomy, and the vaginal incision is closed with chromic catgut.

The sutures should include the vaginal walls and peritoneal folds. If drainage is required the incision is left partly or entirely open and a gauze drain inserted.

Technic of Anterior Colpoceliotomy.—The anterior lip of the cervix is grasped by vulsellum forceps and the cervix is drawn down to the vulvar orifice. A transverse incision is made through the vaginal wall at its junction with the cervix. The bladder is stripped from the cervix by the index finger to the reflection of the peritoneum. The peritoneum is incised and the opening enlarged with the fingers. The bladder is now freely separated from the uterus and vaginal wall. Through this liberal incision, tumors of the ovary, the size of a man's fist, can be delivered and large cysts may be tapped with a trocar, the contents emptied, and the collapsed sac withdrawn through the incision by means of heavy clamps. If the pedicle is of the usual length the uterus may remain *in situ*, but if not, the body of the uterus must be drawn into the vagina. The pedicle is then ligated with catgut, incised, and the original incision through the vaginal wall closed with chromic catgut.

Abdominal Ovariotomy.—*Incision into the Abdomen.*—A median abdominal incision is made, sufficient in length to admit two fingers. Through this incision the abdomen is explored, and if it is determined to proceed with the removal of the ovarian tumor, the incision is extended to the required length. It is rarely necessary to extend the incision above the umbilicus. Caution must be exercised in opening into the peritoneal cavity, in the presence of adhesions, to avoid incising the tumor or bladder, and injuring adherent coils of bowel.

Evacuation of the Cyst.—A long strip of sterile gauze is inserted between the cyst and abdominal wall on all sides of the incision, leaving exposed a small area of cyst wall immediately below the incision.

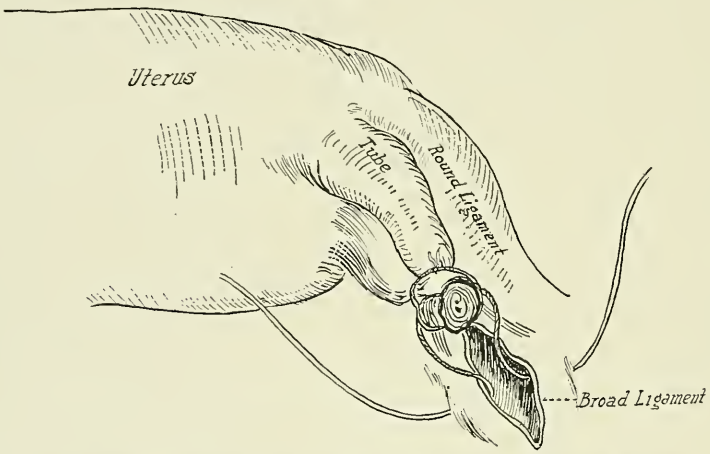
At this point a trocar is thrust into the cavity of the cyst and the contents allowed to drain off into a basin. As the cyst collapses its walls are grasped by forceps on either side of the puncture. Traction is made upon the cyst by means of the forceps, and as the cyst is withdrawn, other forceps are applied lower down on the cyst. The patient's body is tilted to the side of the assistant holding the forceps. If no adhesions exist, the cyst is readily delivered from the abdominal cavity and the pedicle brought into the hands of the operator. Care should be taken to avoid soiling the peritoneal cavity and hands of the operator with the contents of the cyst. A sterile towel should be placed over the delivered cyst while ligating the pedicle.

When the contents of the cyst are mucinous, or there exist numerous small cysts, it may be necessary to greatly enlarge the incision to deliver the tumor *en masse*. If the contents are infected, the greatest caution must be exercised in protecting the peritoneum and hands.

If the tumor is malignant it is advisable to make a free incision so as to work rapidly and to remove the cyst without puncture.

Breaking the Adhesions.—When the adhesions are not firm, little difficulty will be experienced in severing them with the fingers. When they are firm and extensive it is often best to sacrifice the outer covering of the cyst to avoid injury to adherent structures, notably the bowel. Great care must be taken to avoid stripping off the parietal peritoneum, an accident that so often happens in the beginning of the dissection by starting on the wrong plane. Omental adhesions may demand resection of the adherent portion of the omentum.

FIG. 491



Invagination of the stump of the tube between the layers of the broad ligament.

Ligation of the Pedicle.—The author usually transfixes the pedicle with two No. 2 plain catgut ligatures. By placing two separate ligatures, the chance of postoperative hemorrhage is lessened. Many operators use silk or linen ligatures. The ligation of the pedicle can be so made as to allow the turning in of the cut surfaces of the stump to prevent adhesions. A reliable substitute would be found in charring the ligated pedicle with the actual cautery; adhesions do not readily form on the charred surface.

Drainage.—No drainage should be made in ordinary cases. When the cyst is infected and it is feared that the peritoneum is contaminated, drainage should not be omitted. It is also well to drain when hemorrhage is feared and when extensive raw surfaces are left. In draining, the author prefers an iodoform gauze pack brought through the cul-de-sac into the vagina. This permits the abdominal incision to be closed. The pack should be removed at the end of forty-eight hours.

The Opposite Ovary.—A close inspection should be made of the opposite ovary. The following rules should apply:

1. Greater conservatism is practised when the patient is young.
2. If the patient is advanced in years the entire ovary should be removed if thought to be similarly affected.
3. In young individuals, resection of the ovary may be made when the opposite ovary is removed for a benign growth and the ovary is evidently diseased.
4. The opposite ovary must be removed *in toto* if the tumor is thought to be malignant.

Intraligamentary Ovarian and Parovarian Cysts.—The technic of removing intraligamentary cysts differs from that above described in that there is usually no pedicle to the tumor, and it is necessary to attack the growth through an incision in the broad ligament.

The broad ligament is split parallel to the transverse diameter of the pelvis and at a level with the pelvic brim. Before proceeding to shell out the cyst, the bloodvessels are ligated on either side. The tumor can then be readily shelled from its investment with little or no fear of hemorrhage. The top of the broad ligament is then sutured with a running catgut suture.

Not all cases are so readily disposed of. When the tumor is large, the ureter may be adherent to its posterior surface and is liable to injury. The peritoneum is lifted from the floor of the pelvis; the rectum, colon, sigmoid, and uterus are displaced and the visceral layers of the peritoneum may be adhered to the anterior parietal peritoneum. The removal of these cysts may be facilitated by first withdrawing the contents through a trocar, then carefully ligating the blood supply. When the cysts are bilateral and lie deeply embedded, the safest procedure is that recommended by Howard Kelly, which is, to remove the uterus and tumors together. When there has been an extensive dissection of the pelvic floor, the ureter should be carefully inspected before closing the broad ligament. If found injured, repair should be made before proceeding to close the rent in the broad ligament.

Papillary Cysts.—It is difficult and at times impossible to make a clinical distinction between benign and malignant papillary cysts of the ovary. All give the appearance of malignancy to the naked eye, and yet in the presence of papillary vegetations engrafted on the peritoneal surfaces of the abdominal organs, the uterus embedded with cauliflower growths on either side and the abdominal cavity distended with fluid, permanant recovery is known to follow upon the removal of the primary growths. We are to distinguish between metastatic invasion by way of the lymphatics and bloodvessels and simple grafts of detached vegetations. Nothing short of a microscopic examination of the primary growth will insure a positive diagnosis, and in so doing, sections must be taken from various portions of the tumor because the malignant changes may be circumscribed.

The only safe rule to adopt is that of Pozzi, who would regard all these tumors as benign in the absence of visceral metastasis. Assuming this

attitude, an attempt is made to remove the primary growths in the hope that detached portions of the growth will disappear spontaneously. If the tumor recurs the abdomen should be again opened and the growth removed if possible. A second and sometimes a third abdominal section may be followed by complete and lasting cure. Not infrequently, however, the tumor returns with all the evidences of malignancy.

When both ovaries are involved it is advantageous to remove the body of the uterus, together with the ovaries. This simplifies the technic and affords better control over the bleeding points.

When one ovary alone is involved and the patient is in the period of sexual maturity, it is advisable to leave the healthy ovary; but if the woman is approaching the menopause, both ovaries should be removed, because of the likelihood of recurrence in the healthy ovary.

Malignancy in Ovarian Tumors.—By a study of statistics from various clinics the author is impressed with the large percentage of malignancy in ovarian tumors. Leopold finds 22 per cent., Fritsch 17.9 per cent., Blau 22.7 per cent., Schultze 27 per cent., Olshausen 15 per cent., Doederlein 15.5 per cent., Freund 21.6 per cent. It may be safely affirmed that one in five of the tumors of the ovary is malignant; hence the dictum to view all tumors of the ovary with suspicion of malignancy, and as an early clinical diagnosis of malignancy cannot be made with certainty, the only safe rule to follow is early removal of all such tumors.

There were many contra-indications to the removal of ovarian tumors in former years but not so today. Operative interference should be delayed for a time for reasons which apply to surgical operations in general: such as inflammations of the air passages, deficiencies in the functions of the heart and kidneys, great anemia, exhaustion, intercurrent infectious diseases, pregnancy, and diabetes. For these reasons the operation may be postponed temporarily if not indefinitely.

Age is no contra-indication when all other conditions are favorable. In extreme old age no operation would likely be advised unless as a palliative measure.

The size of the tumor, the presence of adhesions, however firm and extensive, the relation of the growth to the broad ligaments and peritoneum; these factors are no longer considered contra-indications to operative interference.

Malignancy of the tumor presents a questionable contra-indication, but cannot be viewed in the light of an absolute contra-indication unless demonstrated by direct inspection through an exploratory incision. In this connection the conclusions of Pozzi, drawn from his observations in papillary growths of the ovary, are worthy of serious consideration. (See page 741.)

When the tumors cannot be removed for any of the above reasons, and much suffering is occasioned, relief may be sought through tapping of the cystic or ascitic fluid.

Tapping of ovarian cysts can only be looked upon as a palliative measure, and is in nowise curative. It may be advisable to tap large

cysts one to four days before proceeding with their removal; this is done to minimize the danger of shock.

Fig. 492

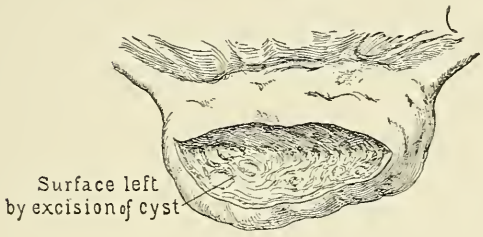
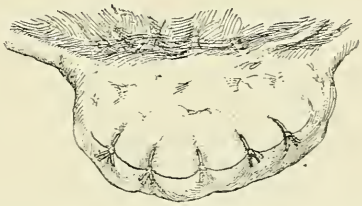
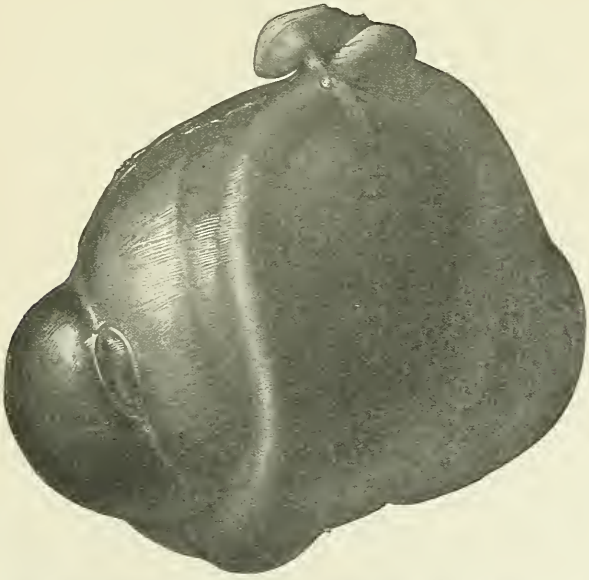


Fig. 493



The upper figure shows the raw surfaces left by the excision of a cyst from the ovary. The lower figure shows the approximation of the wound surfaces by fine silk sutures. (Kelly-Noble.)

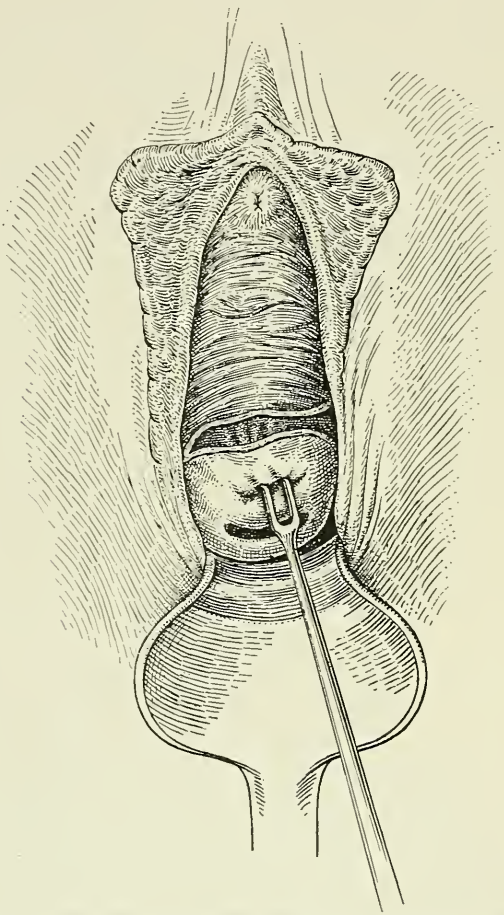
Fig. 494



Tuboövarian abscess removed by amputating the uterine cornu. (After T. S. Cullen.)

Treatment of Ovarian Tumors Complicating Pregnancy, Labor, and the Puerperium.—Pregnancy.—The treatment of pregnancy complicated by the presence of an ovarian tumor is one of watchful expectancy so long as the pregnancy is permitted to progress favorably and the tumor gives no signs of serious complications.

Fig. 495



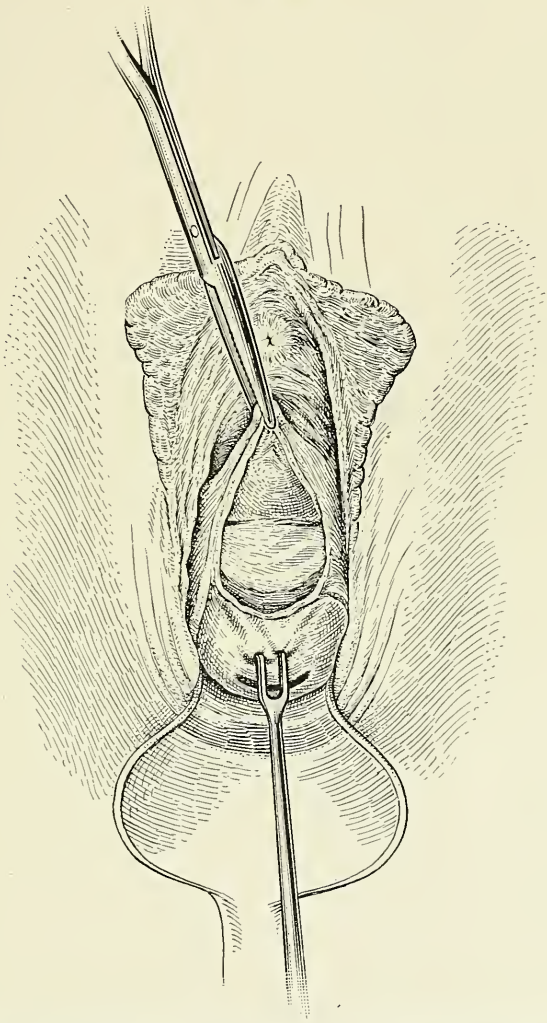
Anterior colpotomy for inspection and possible operation upon the appendages. The cervix is drawn forcibly downward and forward by a tenaculum and a transverse incision is made with scissors and tissue forceps through the vaginal wall about one-half inch above the external os. Step 1.

The presence of an ovarian tumor complicating pregnancy will result in abortion in 19.4 per cent. of cases (Orgler-Graefe-Heil).

When ovariotomy has been performed in the period of gestation, death of the fetus has occurred in 30 per cent. of cases (Fehling). This is an expression of the frequency with which abortions follow ovariotomy. The maternal mortality of ovariotomy in pregnancy is little

greater than in ovariotomies uncomplicated by pregnancy. Orgler puts it at 2.7 per cent. In fact, the percentage is possibly less, because the tumors are less likely to be malignant and adherent, and the age of the individual is favorable to a good result.

Fig. 496

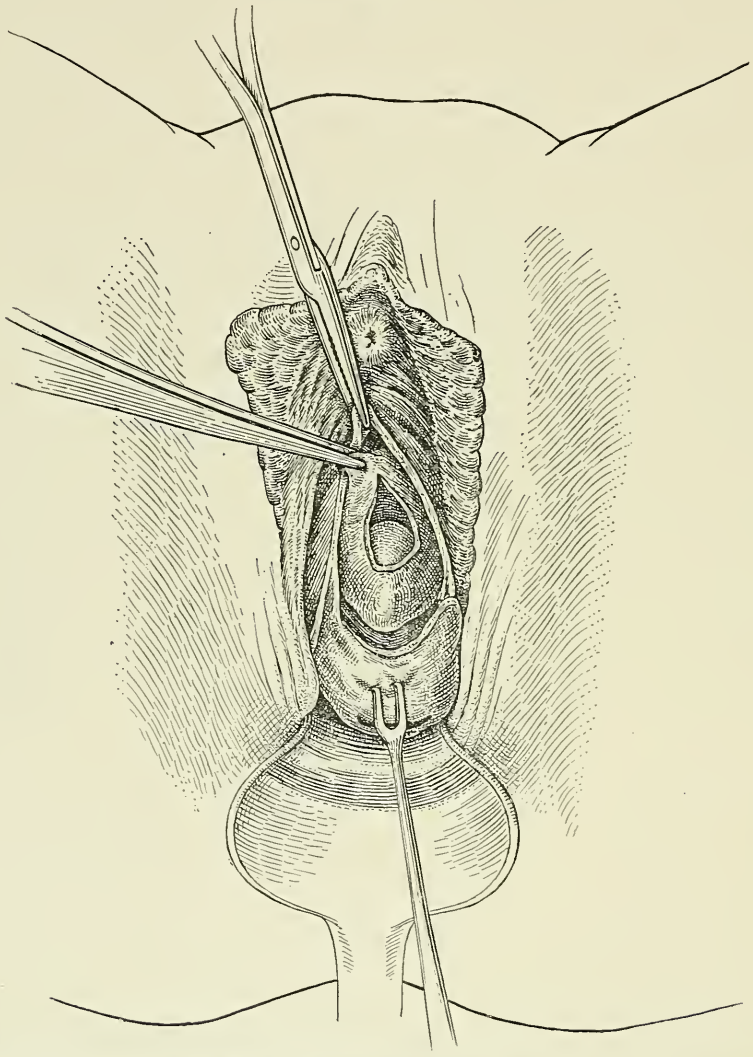


Anterior colpotomy. The vaginal wall is stripped upward by the finger covered with gauze. The vesico-uterine fold of peritoneum is exposed to view. Step 2.

The earlier the operation is performed in the period of gestation, the better the chances for both the mother and fetus. The more advanced the pregnancy, the more liable are we to meet with serious complications.

The presence of bilateral ovarian tumors does not contraindicate operative interference in the course of pregnancy. In event of a rapid growth of the tumor, of torsion of the pedicle, rupture of the cyst,

FIG. 497

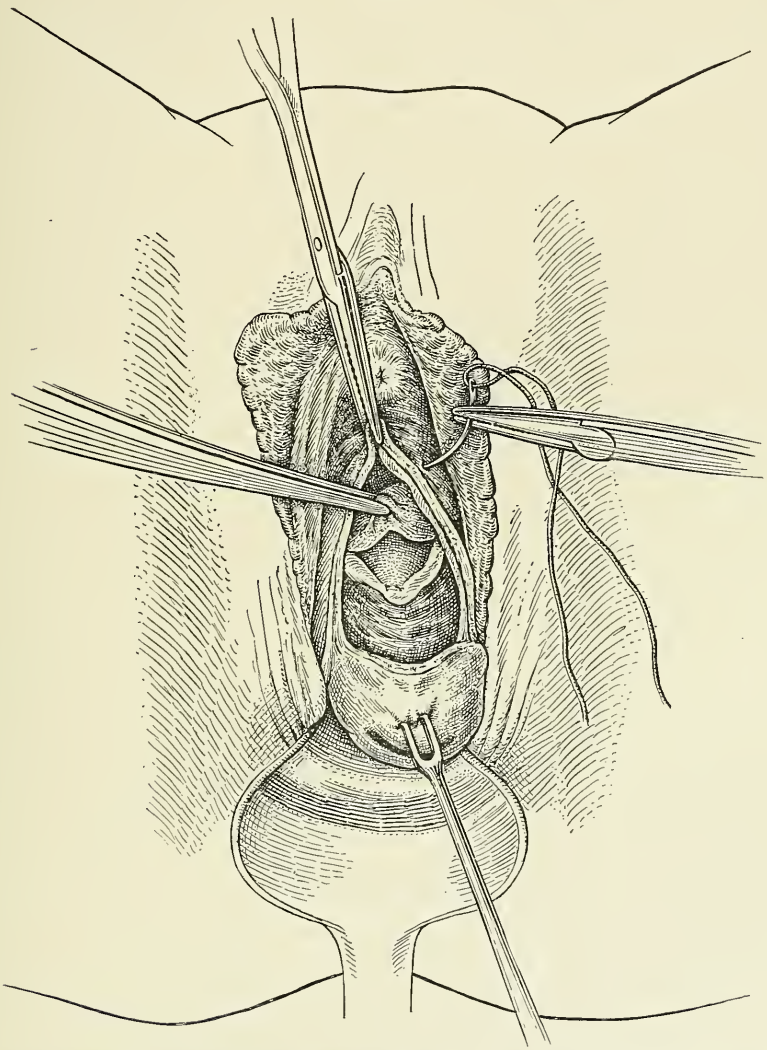


Anterior colpotomy. A transverse incision is made through the peritoneum and the body of the uterus is exposed to view. Step 3.

or interference with the development of the gravid uterus, resort must be had to ovariotomy, and in performing the operation every means possible must be employed to conserve the interests of the child *in utero*.

Labor.—Labor may progress uninterruptedly in the presence of a large ovarian tumor which lies high in the abdomen. When low in the pelvis, a tumor of moderate size may obstruct labor. Again, torsion of the pedicle or rupture of the cyst may necessitate an abdominal

FIG. 498

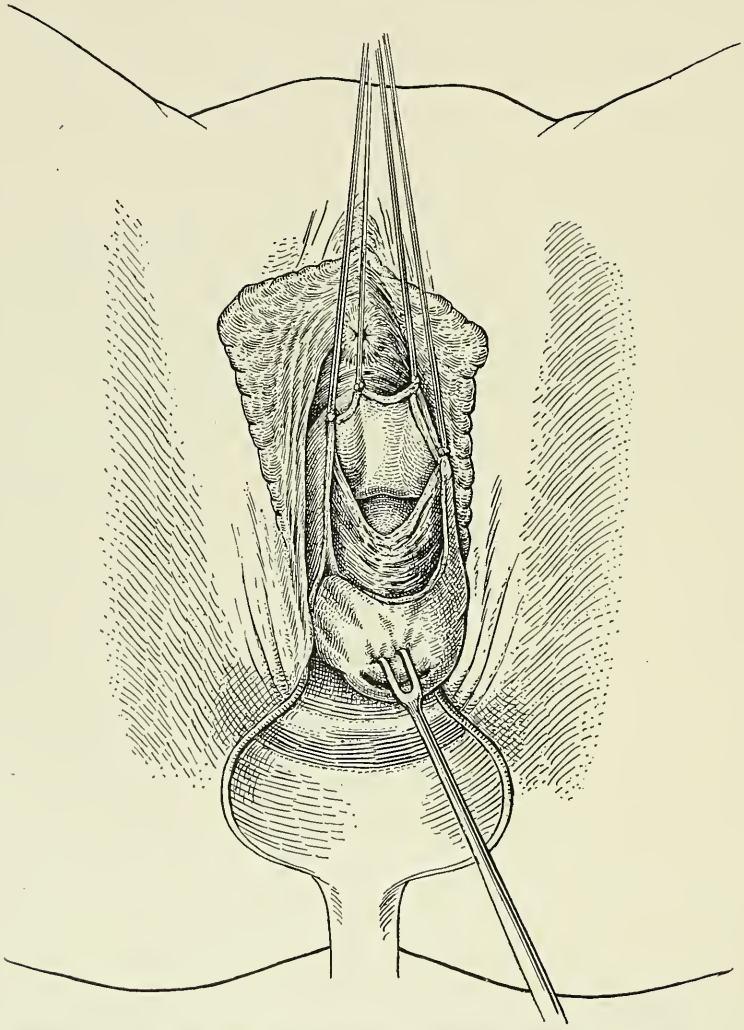


Anterior colpotomy. Catgut sutures are passed through the vaginal wall and peritoneum. Step 4.

section for the removal of the cyst. The effort should be made to dislodge tumors incarcerated in the pelvis by bimanual manipulations, in order to provide space for the passage of the child. To do this most effectively the knee-chest position is advised. An anesthetic may be

required, and if so, the exaggerated Trendelenburg position is advised. If it is found impossible to deliver the child and the tumor is cystic, the next mode of procedure would be to tap the cyst. This may be done through the vagina, if the tumor lies sufficiently low in the pelvis or

Fig. 499



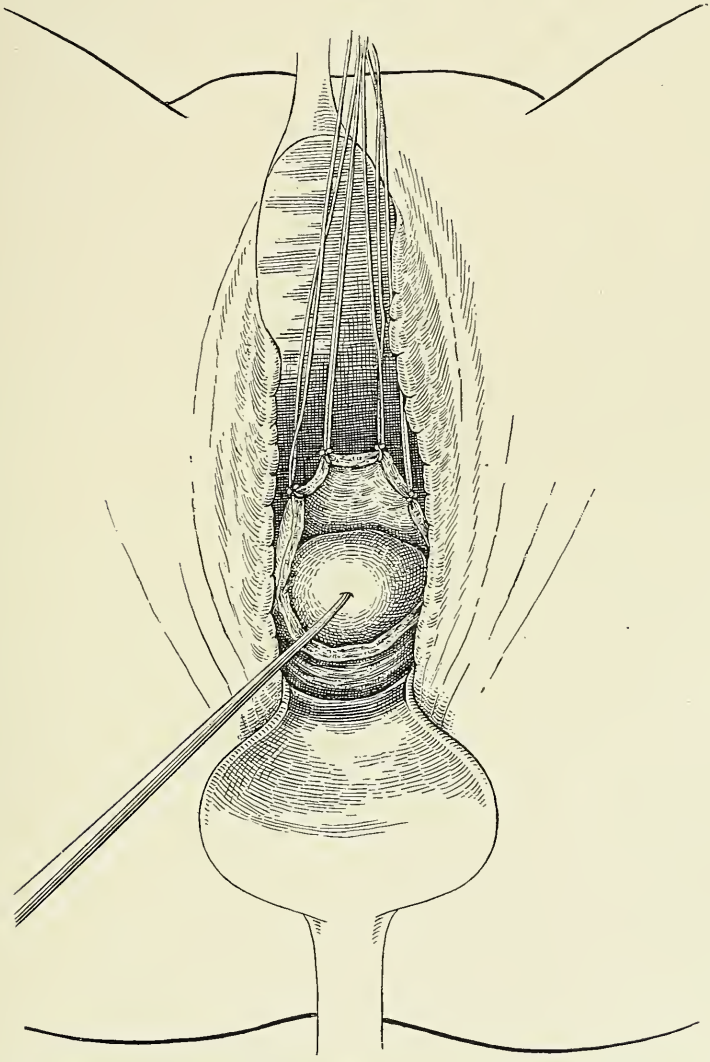
Anterior colpotomy. The peritoneum is sutured to the anterior vaginal wall. Step 5.

through the abdomen, if high up and of a size and position to make the operation safe and feasible.

When the tumor is solid or semisolid, and when it cannot be tapped for any other reason, resort must be had to an abdominal incision

with removal of the tumor, after which a Cesarean section may be performed and the abdomen closed. This in many instances would be preferable to delivering the child *per viam naturalis* after ovariotomy.

Fig. 500

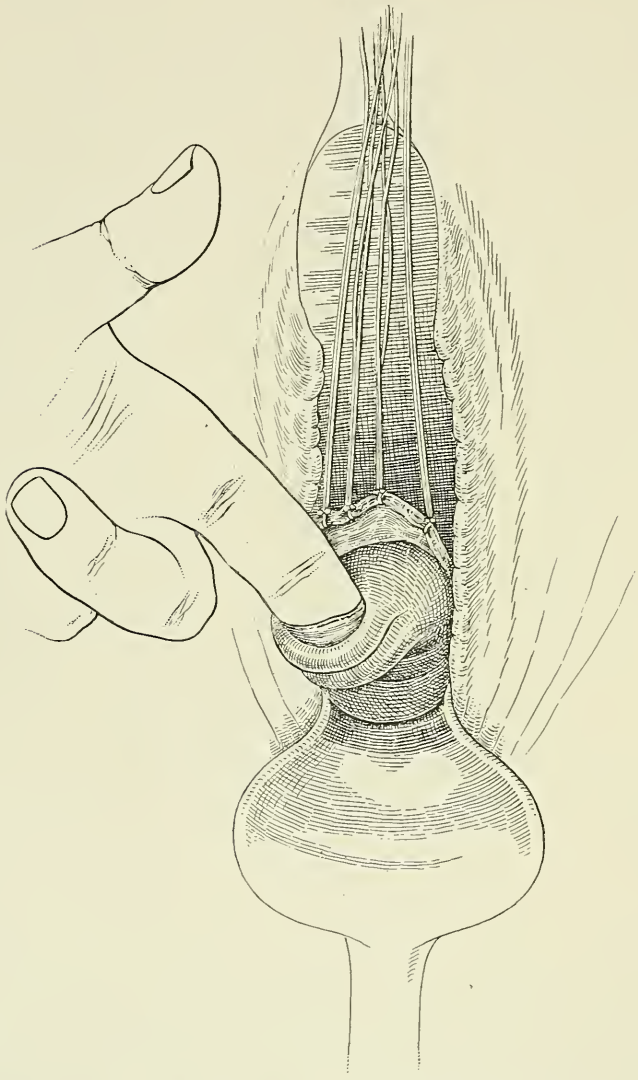


Anterior colpotomy. Delivery of the uterus through an anterior colpotomy. Step 6.

Puerperium.—During the puerperium the tumor may become infected or torsion of the pedicle may occur. In such an event the tumor must be removed by way of the abdomen, and that without delay. The puerperium presents no contra-indication to ovariotomy.

Complications following Ovariotomy.—Shock may be prevented in the majority of cases by a carefully administered anesthetic, by preventing undue loss of blood, by avoiding unnecessary exposure of the bowel, by rapid operating, and by keeping the operating room at the proper temperature.

FIG. 501

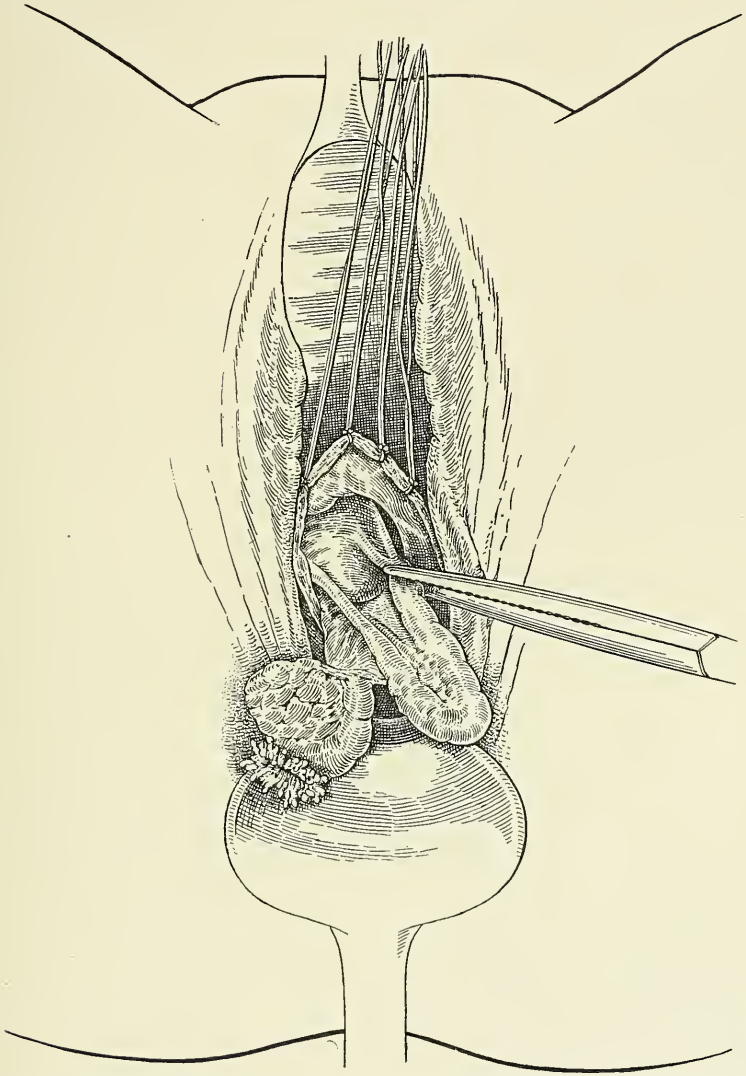


Anterior colpotomy. Delivery of the tube and ovary through an anterior colpotomy. Step 7.

General peritonitis and local infections do not follow with greater frequency than in other abdominal operations.

Secondary hemorrhage was formerly feared from the slipping of the ligature about the pedicle.

Fig. 502

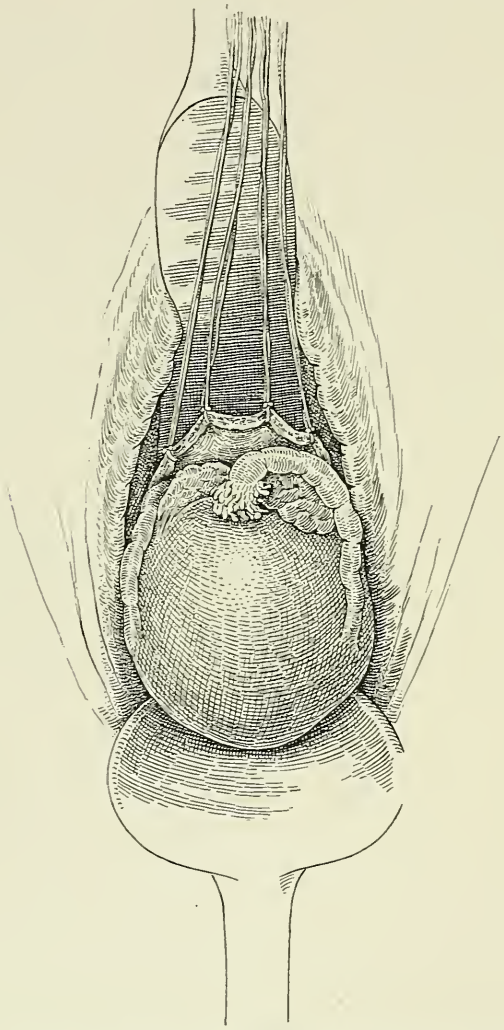


Anterior colpotomy. Inspection of the tube and ovary. In this step the tubes and ovaries may be freed from adhesions, the end of the tube may be resected, part of the ovary may be excised, or the tube and ovary may be wholly removed. Step 8.

Bronchitis, bronchopneumonia, pulmonary embolism, and edema are occasional complications. Cystitis, acute degeneration of the heart muscle, and ileus are also mentioned among the occasional postoperative complications.

Mortality in Ovariotomy.—Pfannenstiel places the average mortality at 5 per cent. Segalowitz collected reports of 1953 ovariotomies, with a mortality of 7.63 per cent.; this was in 1903. Doederlein reports a

Fig. 503

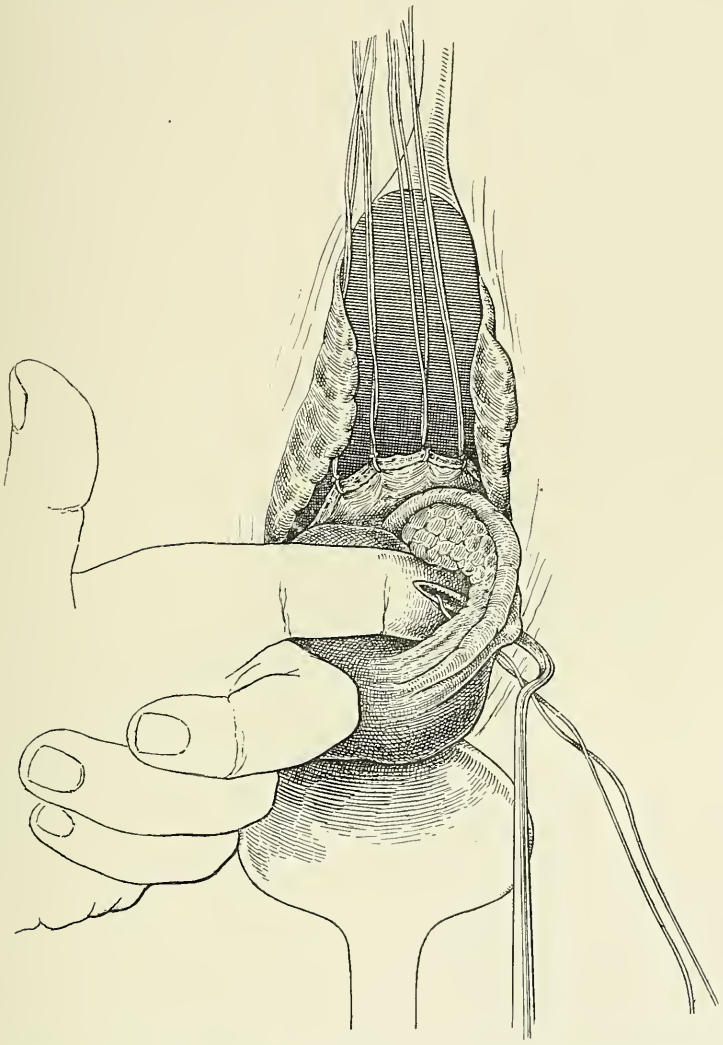


Anterior colpotomy. Delivery of the body of the uterus and both appendages through an anterior colpotomy. Step 9.

mortality of 3.5 per cent., while Martin, Winter, and Fritsch each have a mortality of about 9 per cent. The causes of death were peritonitis, ileus, pneumonia, nephritis, cachexia, and anemia. In an

uncomplicated ovariotomy the mortality should be almost *nil*, while with the malignant tumors of the ovary, ovariotomy has a mortality of 18 to 40 per cent.

Fig. 504



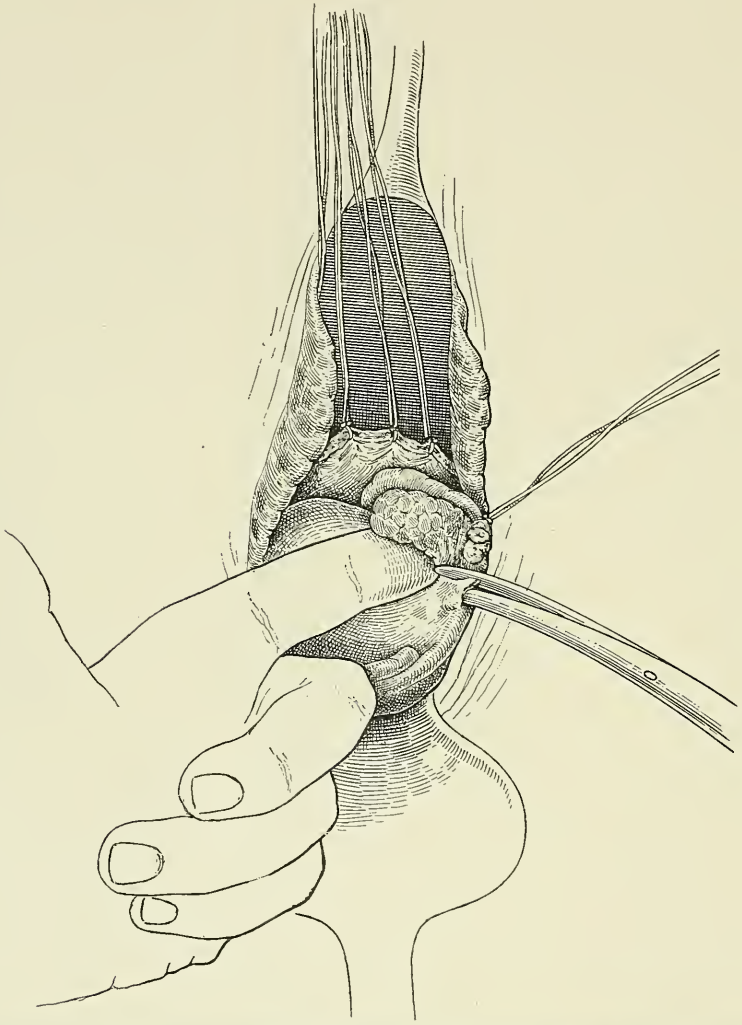
Anterior colpotomy. Ligature of the tube and ovarian ligament through an anterior colpotomy, preparatory to their removal. Step 10.

Conservative Operations on the Ovary.—Before entering upon a discussion of the operative measures designed for the relief of diseases of the ovaries, it would be well to state clearly and emphatically that not all lesions of the ovary demand operative interference.

Cystic degeneration of the ovary may exist without giving rise to

serious local or general disturbances, and in this event there is no justification for either medical or surgical intervention. A displaced ovary may give rise to no symptoms, and should then be let alone. In the acute stage of inflammation the same general and local pro-

FIG. 505

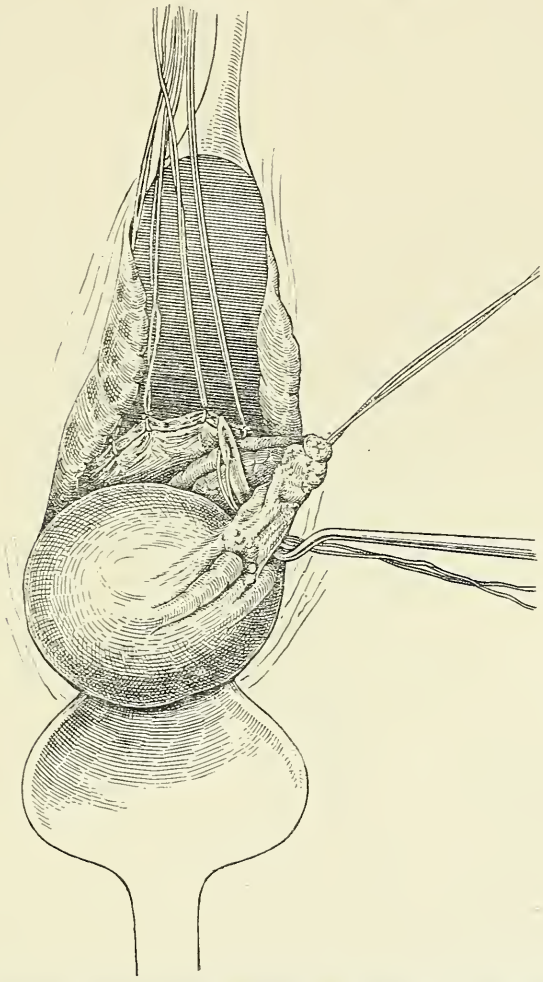


Anterior colpotomy. Severing tube and ovarian ligament from uterus through an anterior colpotomy. Step 11.

cedures should prevail in the treatment as have been recorded for acute inflammations of the uterus. Rest must be enjoined, long-continued hot vaginal douches, ice-bag to the abdomen, glycerin and ichthyol tampons, free evacuation of the bowel, and the maintenance of a light,

nutritious diet should be prescribed in the hope that the inflammation will subside. If in the course of time pus accumulates in the ovary or certain tissue changes remain which lead to serious and persistent local distress, surgery should be invoked.

Fig. 506

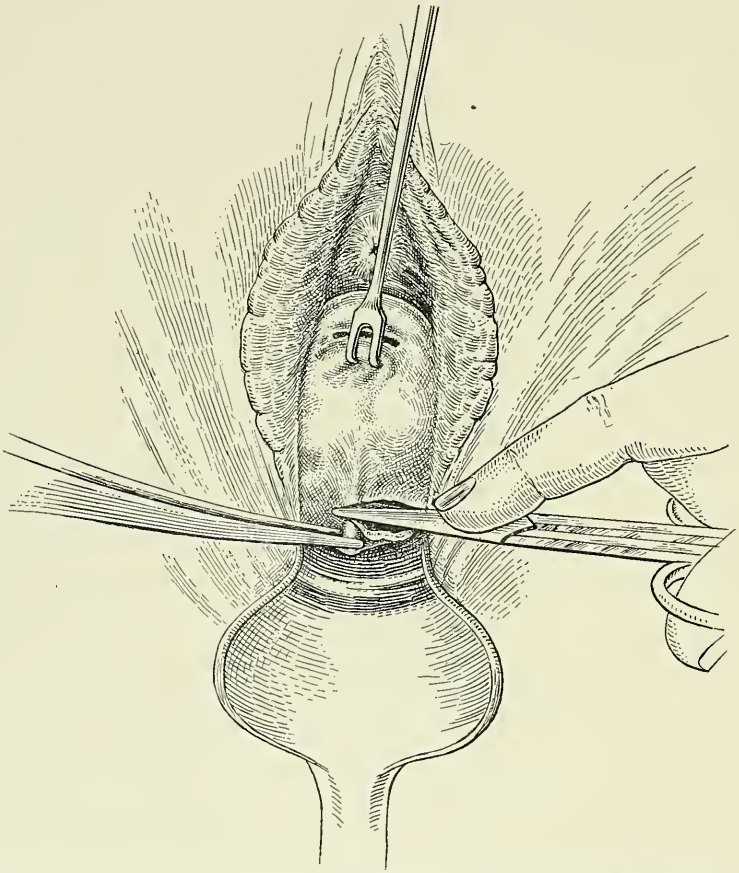


Anterior colpotomy. Ligature of the infundibulopelvic ligament through an anterior colpotomy. The broad ligament is sutured after the removal of the appendages and the round ligament is sutured to the posterior surface of the fundus. Step 12.

On page 468 the author has argued for conservatism in the surgery of the tube, and has stated his reasons therefor. In the surgery of the ovary there is a much wider scope for conservatism. The following lesions are amenable to conservative treatment:

Periovaritis.—When adhesions bind the ovary to neighboring tissues and the structure of the ovary is not impaired, the simple severing of the adhesions is all that is required. If the surface of the ovary presents a raw surface after the breaking up of the adhesions, the author generally lightly chars the surface with the thermocautery to prevent the reformation of adhesions. Not uncommonly there is more or less cystic

FIG. 507



Posterior colpotomy for inspection and possible operation upon the uterine appendages. The vaginal wall is grasped by tissue forceps at its juncture with the posterior wall of the cervix. A transverse incision is made with scissors through the vaginal wall and peritoneum. Step 1.

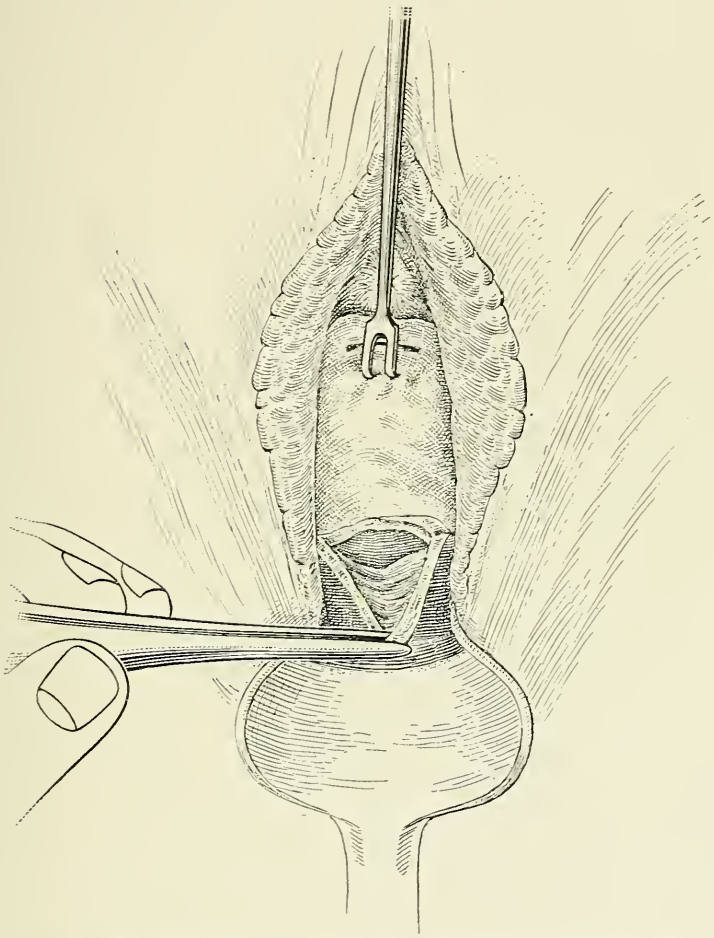
degeneration of the ovaries, in which event a resection of the ovary will remove all or the greater part of the raw surface created by the breaking up of the adhesions.

In breaking frail adhesions little difficulty will be experienced. When the adhesions are extensive it may be necessary to resort to the scissors. With the ovary firmly embedded in adhesions it is best to proceed

from below upward. In this manner the ovary is rolled upon its hilum as an axis.

Cystic Degeneration.—Multiple Graafian and corpus luteum cysts may be removed, either by resection with the knife or by cauterizing. From the author's microscopic and clinical studies of 180 cases of

FIG. 508



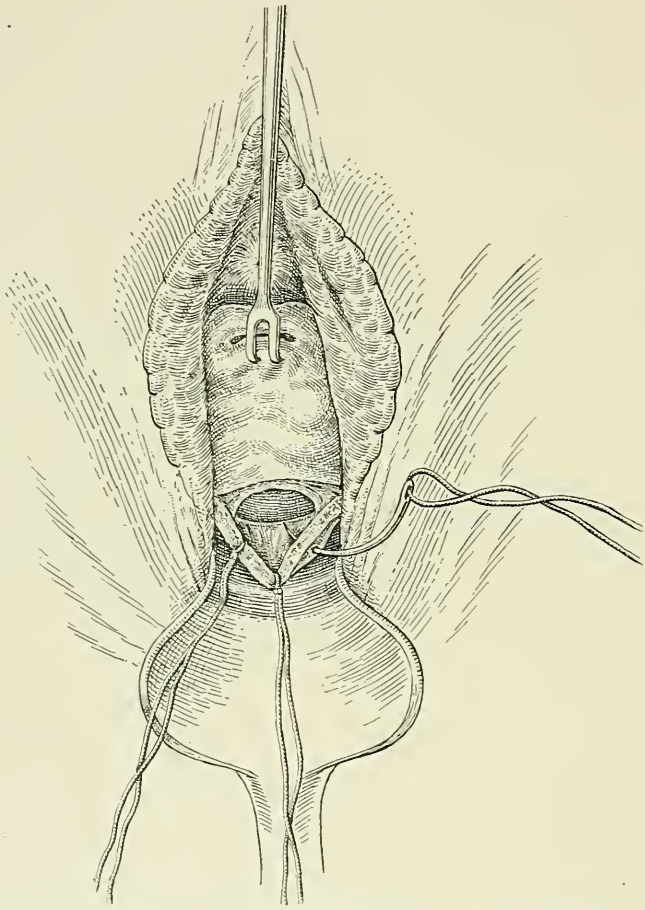
Posterior colpotomy. With the cervix drawn forward and upward and the margins of the incision held apart, the posterior wall of the uterus is brought to view. Step 2.

cystic degeneration of the ovaries which required operative interference,[1] the author concluded his report by asking the question, "*Should we operate on cystic ovaries?*" In answer to this question, he said that the frequent occurrence of symptoms referable to the ovaries justifies

[1] Trans. Chicago Gyn. Soc., 1903–4.

the practice of resecting or cauterizing and sometimes of removing the ovary, when the abdomen has been opened for the relief of other pelvic lesions. This should be the rule when the performance would not entail greater risk to the patient. Such a practice will frequently contribute to the complete relief of the patient.

FIG. 509



Posterior colpotomy. The peritoneum is stitched to the incised vaginal wall with interrupted catgut sutures. Step 3.

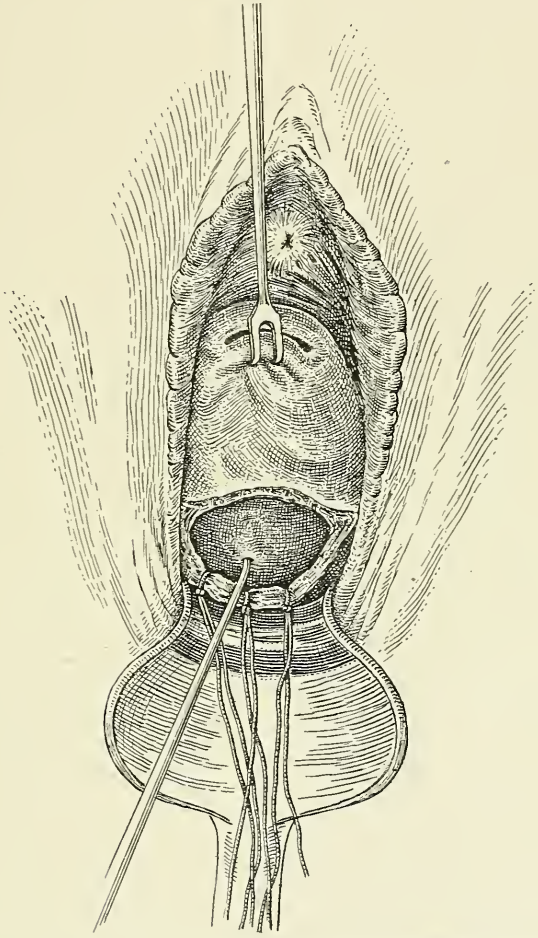
The question of operating upon uncomplicated cases of cystic ovaries is more debatable. The lesion frequently has absolutely no clinical entity, and therefore, should not be interfered with. On the other hand, in a definite proportion of cases there is sufficient local discomfort to justify surgical interference.

When pain, tenderness, and dysmenorrhea are complained of the surgeon must first satisfy himself that these complaints are not the

result of associated lesions or the expression of a general nervous disorder.

I believe in the resection and even in the complete removal of uncomplicated cystic ovaries, but only when local discomfort, which is the direct result of the lesion, justifies the sacrifice of part or all of the ovaries. Such cases are not common.

FIG. 510



Posterior colpotomy. The body of the uterus is drawn through the incision by means of a tenaculum forceps. Step 4.

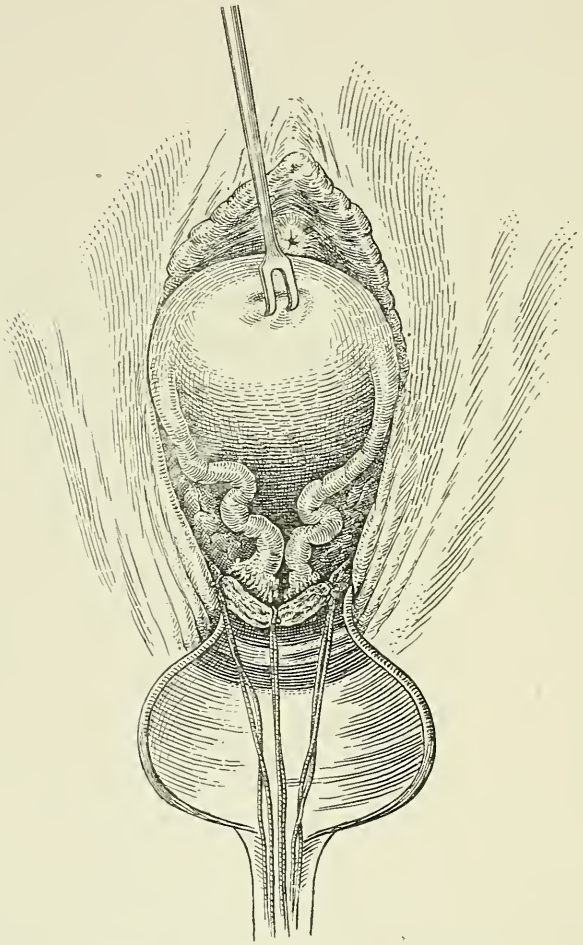
The above conclusions were written in 1903, and since that time, increasing experience has served to confirm all that was then stated.

The author is in full accord with Dr. Edward Reynolds, who does not operate on these cases merely because they exist, but operates for the relief of distressing symptoms (dysmenorrhea, catamenial

depression) referable to the ovaries; he believes that these symptoms will be relieved in the majority of cases by resection of the ovaries.

It is not often that the abdomen is opened for the simple correction of this condition. There are other lesions, such as retroversion, uterine fibroids, and chronic metritis, which commonly accompany the condition and call for correction.

FIG. 511



Posterior colpotomy. The fundus and appendages are delivered through the posterior incision and the uterine appendages inspected. The same procedures may be carried out as in anterior colpotomy. Step 5. (See Figs. 499, 500, 501, 503, and 504.)

Technic of Excision of Part of the Ovary.—Long hemostatic forceps are made to grasp the ovarian ligament on the one side of the ovary and the suspensory ligament on the other. When possible the ovary is delivered through the abdominal incision and a gauze pad is tucked

underneath the ovary and tube. The portion to be resected is grasped with rat-tooth forceps and a wedge-shaped incision is made to embrace the cystic portion of the ovary. Such cysts as remain after the excision are punctured with the knife and the secreting epithelium destroyed by scarification. If the excision is deep, it is well to bury a row of sutures and then to continue with a running suture the closure of the wedge. No. 1 plain sterile catgut will suffice for the purpose.

Two points are of special importance in resecting the ovary: (1) The ovarian blood supply must not be interfered with, and (2) the ovary is to be secured in its normal position. If these two conditions are met there will be little trouble from the recurrence of cystic degeneration. The cut surfaces must be accurately coapted and the ovary not handled roughly in order to avoid postoperative adhesions. Absolute hemostasis should be secured.

Compensatory hypertrophy undoubtedly occurs in the resected ovary.

When the entire ovary is to be removed, because of the complete degeneration of its structure, the organ is severed from its hilum by a wedge-shaped incision; this is closed by a running catgut suture. Careful coaptation of the tissues is essential in the prevention of postoperative adhesions and hemorrhage.

Under no circumstances should both ovaries be sacrificed in the period of sexual maturity. At least part or all of one ovary should be conserved.

Ovarian Abscesses.—Ovarian abscesses are rarely treated conservatively except in vaginal drainage. It would seem hazardous to clean out an abscess cavity in the ovary and suture the cavity, leaving the ovary *in situ*. It is, however, occasionally possible to conserve a portion of the ovary which has not directly formed a part of the abscess wall.

When *malignancy* exists in an ovary it is not only imperative that the entire ovary should be sacrificed, but because of the frequency with which the disease occurs in both ovaries, the slightest suspicion of the existence of the lesion in the opposite side would justify the sacrifice of the organ.

CHAPTER XXX

TRAUMATIC INJURIES OF THE GENITAL ORGANS

Wounds of the Vulva and Pelvic Floor
Colpoperineorrhaphy
External Superficial Tear
Internal Tear and Combined External and Internal Tears (Incomplete Laceration of the Perineum)
Late Repair of a Complete Rupture of the Rectovaginal Septum
Repair of the Sphincter Ani Muscle
Relaxed Outlet of the Rectovaginal Septum
After-treatment of Plastic Operations on the Pelvic Floor
Wounds of the Vagina
Acquired Stenosis and Atresia of the Vagina
Wounds of the Cervix
Immediate Repair of a Lacerated Cervix
Amputation of the Cervix
Perforating Wounds of the Uterus

WOUNDS OF THE VULVA AND PELVIC FLOOR

Etiology.—The vulva is a common seat of injury, and such injuries are often serious because of the great liability to hemorrhage and infection.

1. **Direct Violence.**—The vulva may sustain direct injury from a blow, from falling astride of an object, from surgical interference, and from violent intercourse. Such injuries result not only in contusions and lacerations of the soft tissues, but in hemorrhage and infection, which may prove fatal. The soft tissues are forced against the sharp edge of the pubis and ischium, so that extensive lacerations are readily produced.

2. **Labor.**—The most frequent cause of injury to the vulva is found in labor. The presenting part of the child and the application of forceps and other instruments lead to contusions of the labia and to lacerations of the perineum, nymphæ, and vestibule.

Symptoms.—The symptoms complained of are pain, hemorrhage, and impaired functions.

Pain.—Pain is of short duration. The sharp, acute pain soon gives way to smarting. If the parts are kept at rest and are not infected the pain should wholly subside.

Hemorrhage.—The vulvar tissues are vascular, so that lacerated wounds may lead to free and even fatal hemorrhage.

Impaired Functions.—The swelling of the tissues which follows upon injuries to the vulva may be extensive, and may interfere with urination and defecation. Injuries to the perineal body may be so extensive as

to lead to loss of support to the vaginal walls, uterus, bladder, and rectum.

Treatment.—General treatment may be required in event of shock, hemorrhage, or infection. (See respective chapters.)

Hemorrhage can usually be controlled by applying a compress of sterile gauze, held in place by a T-binder. Additional pressure may be gained by packing the vagina with sterile gauze. When this does not suffice to control the bleeding, the bloodvessels must be ligated with catgut.

Contusions are best treated by the application of hot compresses. Lead water and laudanum is a soothing application. If there is no evidence of infection in the wound, sutures should be inserted and a sterile pad of gauze placed over the sutured wound and held in place by a T-binder. Catgut should be used in all deep wounds and silk or silkworm gut in superficial wounds. Voluntary urination should be encouraged and the wound douched with an antiseptic solution after urinating. When the wound is infected it is best to leave it open and drain with gauze saturated in Wright's solution, and to apply a hot antiseptic compress over the vulva until the acute inflammatory reaction has subsided, after which a dry sterile pad may be substituted for the hot compress. (For a discussion of perineal wounds see below.)

COLPOPERINEORRHAPHY

Recent and late obstetric injuries to the rectovaginal septum are classified under three heads:

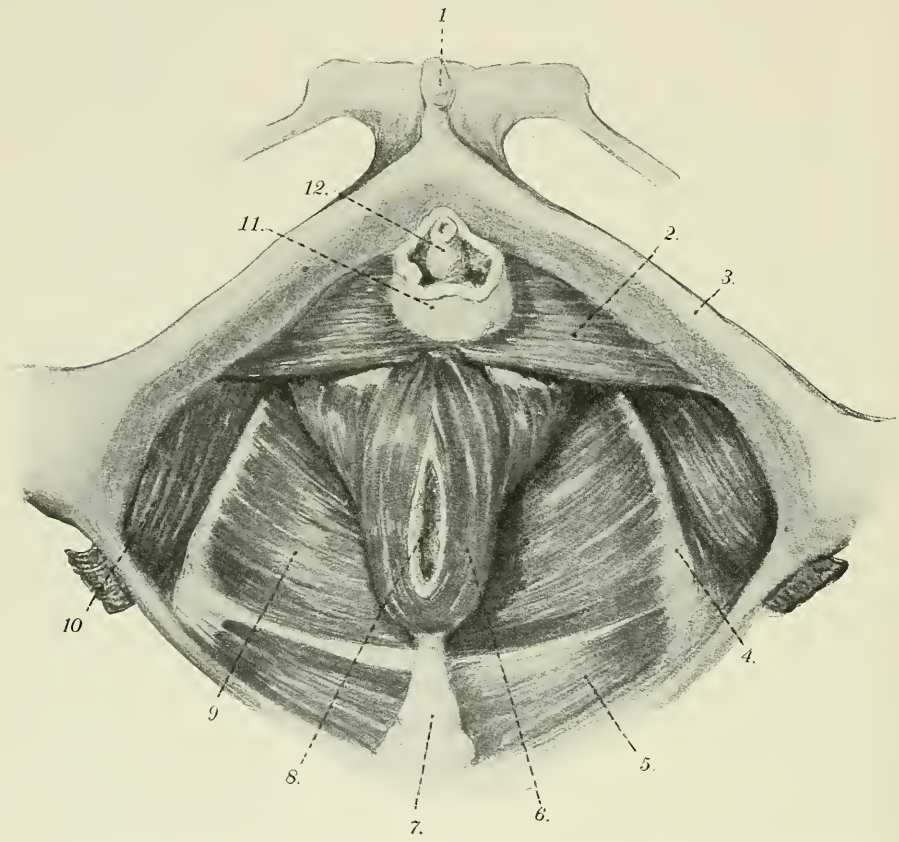
1. External superficial tear.
2. Internal and combined external and internal tears.
3. Complete tear of the rectovaginal septum.

External Superficial Tear.—All such injuries should be repaired immediately following delivery, but not having been repaired at this time, they present no indication for operative interference unless they have healed with a tender scar. This is true because the support of the uterus and vaginal walls has not been weakened. The tear only involves the skin surface and lax tissues which lie between the fourchette and rectum, possibly extending through the vaginal mucosa for a limited distance.

Immediate Repair.—*Technic of Operation.*—The lips of the tear are held apart by the thumb and index finger of the left hand. The first suture is passed immediately below the upper angle of the tear. One or two additional sutures are passed at intervals of a half inch below this point. The sutures are then tied from above downward. In this manner the tissues are restored to their original position. Care must be taken to avoid tying the sutures too tight for fear of interfering with the circulation in the tissues and predisposing to infection. The sutures may be removed on the eighth day. The author's preference is for silkworm gut.

Late Repair.—*Technic of Operation.*—Tenacula are made to grasp the divided ends of the carunculæ. A third tenaculum grasps the midpoint of the scar at the lower limit. The scar is then placed upon the stretch by the assistants making gentle traction upon the tenacula. In this manner a triagular area of the scar tissue is exposed for denudation.

FIG. 512



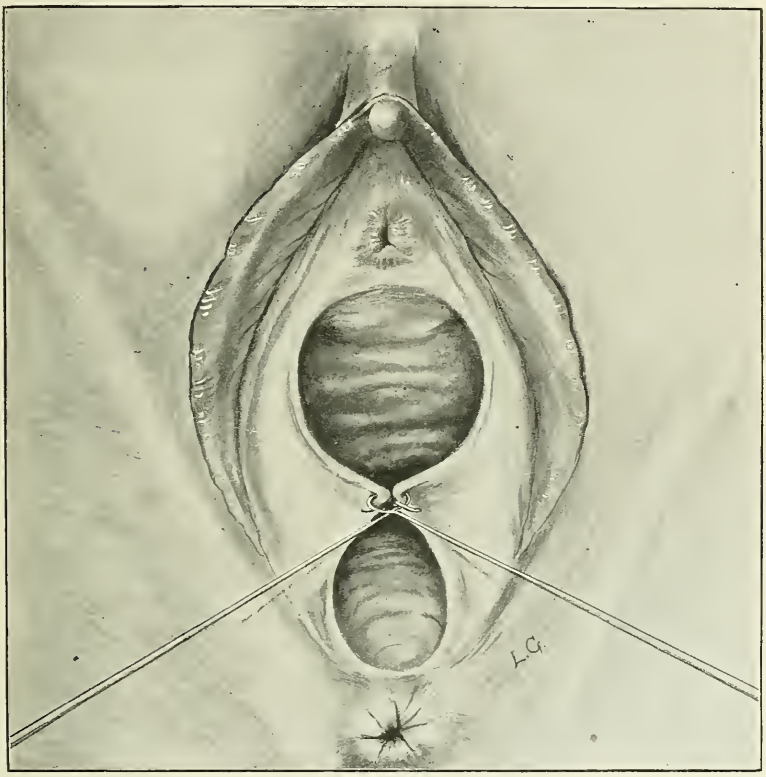
Dissection of the female perineum. 1, glans clitoridis; 2, urogenital muscle of trigone; 3, inferior ramus of pubis and ischium; 4, tendon of levator ani muscle; 5, coccygeal muscle; 6, external sphincter ani muscle; 7, coccyx; 8, anus; 9, levator ani muscle; 10, internal obturator muscle; 11, vagina; 12, urethra. (Leipmann.)

With sharp-pointed angular scissors and rat-tooth tissue forceps, the area of denudation is outlined by connecting the angles of the triangle marked by the tenacula. With a sharp scalpel the scar is removed, leaving a denuded triangle.

A long curved needle, threaded with chromic catgut or silk, is passed from a point $\frac{1}{2}$ to 1 cm. external to the right upper angle to a corresponding point on the opposite side and including the intervening tissues. At intervals of one-half inch similar sutures are passed from

above downward. When these sutures are tied the line of union is vertical and in the median line. These sutures are cut short and a dressing of iodoform gauze, with a pad of sterile gauze, is applied and held in place by a T-binder.

Fig. 513

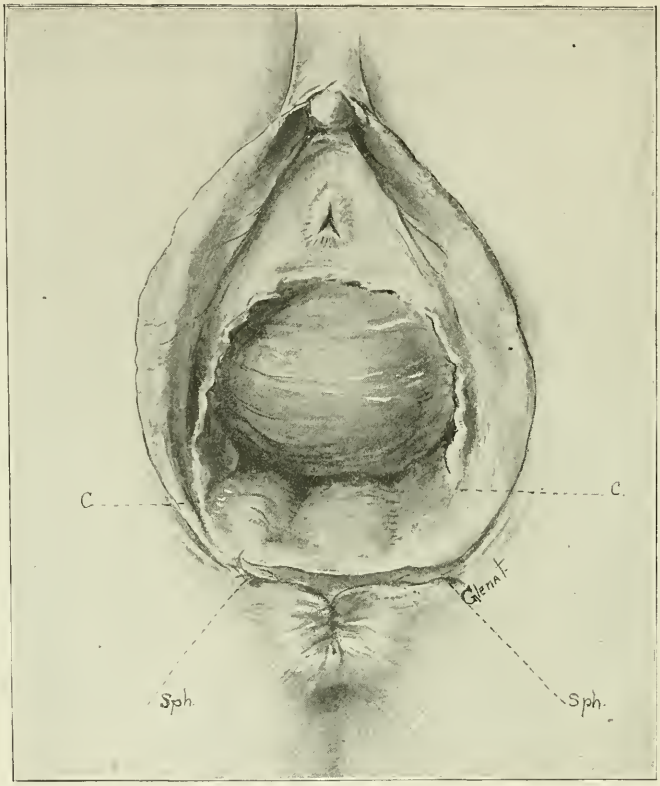


The divided ends of the caruncular ring in the figure are approximated by tenacula. In this manner the extent of the laceration is demonstrated.

Internal Tear and Combined External and Internal Tears (Incomplete Laceration of the Perineum).—Internal tears, in the absence of external tears, are commonly overlooked. They extend from the hymen or fourchette a variable depth upward and outward to one or both sulci. Such injuries lead to relaxation of the pelvic floor and materially weaken the support to the uterus and vaginal walls. The author emphasizes the necessity of close inspection of the vaginal walls after the completion of labor, and if found torn, sutures are to be inserted so that they will unite the severed tissues. The perineal body is often seen represented by skin and connective tissue, there being no muscular or facial structures to afford the needed support. This arises through failure to recognize deep internal tears or through faulty suturing of

combined internal and external tears by passing sutures through the skin and including the intervening lacerated tissues. In so doing the vaginal tears are not sutured.

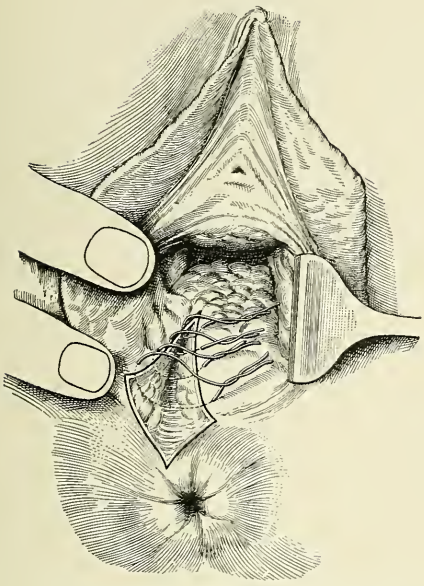
Fig. 514



Complete laceration of the perineum with cystocele. *C*, divided ends of caruncular ring; *Sph*, divided ends of the sphincter. The loss of the pelvic floor and the sagging of the anterior wall of the vagina precede the descent of the uterus.

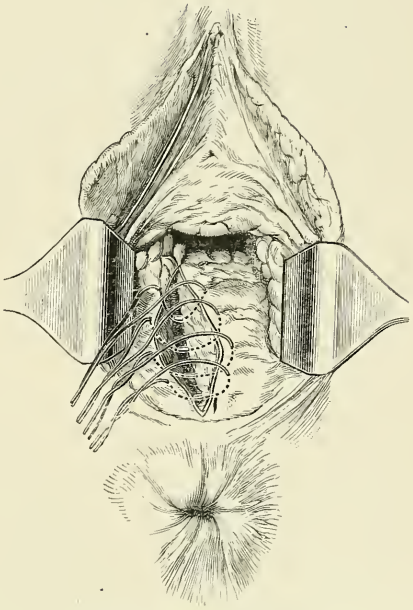
Immediate Repair.—*Technic of Operation.*—The patient is placed in the lithotomy position at the edge of the bed, or preferably on an operating table. A general anesthetic is given. The field of operation is prepared by scrubbing, shaving, washing with sterile water, and scrubbing with alcohol. Sterile towels are then placed about the field of operation and the operator proceeds to place the sutures. The tear is exposed by the thumb and index fingers of the left hand. If the tear extends deeply into the vagina, the anterior wall of the vagina should be supported by a retractor. The sutures placed in the vagina should be No. 2, ten-day chromic catgut, and those placed in the perineum should be of silk or silkworm gut. The first suture is passed

FIG. 515



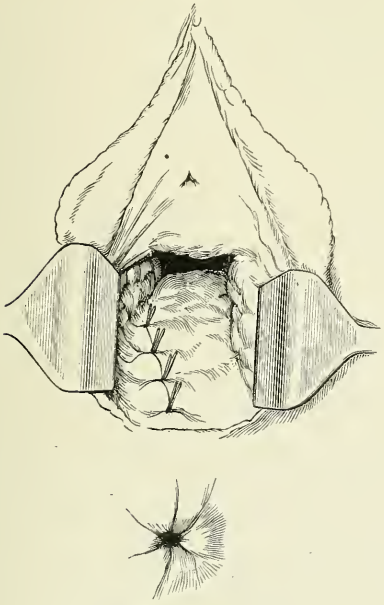
Superficial combined internal and external tear, showing portion of tear in vagina that may escape notice. (Jewett.)

FIG. 516



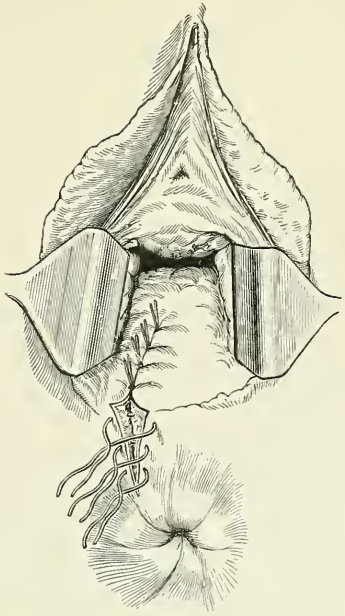
Internal stitches in position.

FIG. 517



Internal stitches tied.

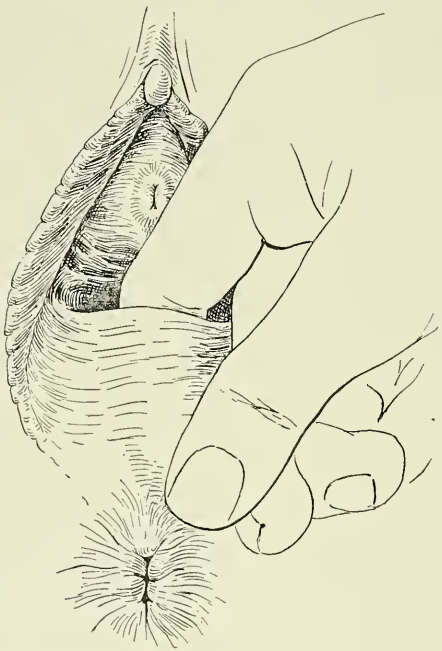
FIG 518



Internal stitches tied, external stitches in position.

just below the upper angle of the tear in the vagina and the successive sutures are passed about one-half inch apart from above downward. A short curved, cutting edge needle is introduced at a point about one-quarter of an inch from the margin of the tear and is carried through the tissues in the direction of the operator, to a midpoint in the floor of the tear, where it is brought out and again made to reënter the tissues at this point and come out at a point in the vaginal walls opposite to its point of entrance. In this second step the needle is carried upward and away from the operator. Each suture should be tied when introduced.

Fig. 519



Demonstrating an internal laceration of the pelvic floor.

Having closed the tear in the vaginal walls the severed skin margins of the perineum are approximated in a similar manner with silk or silkworm gut.

After-treatment.—The patient should be encouraged to pass her urine, after which the perineum is douched with an antiseptic solution and a sterile pad applied to the vulva. When there is retention of urine the catheter must be used. The bowels should be moved at the end of forty-eight hours. It is not necessary to tie the knees. On the contrary the patient should be permitted to shift her position at will.

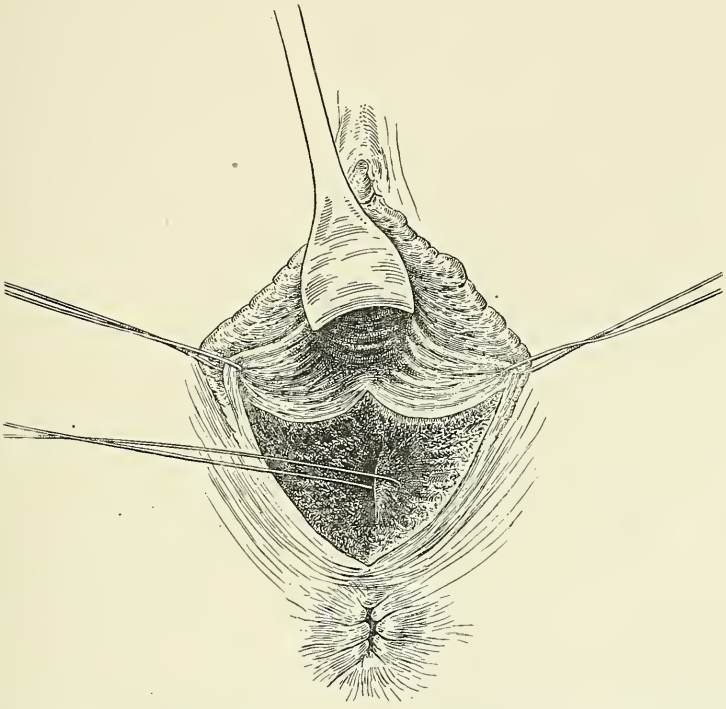
Late Repair.—*Technic of Operation.*—A great variety of operations have been devised, all having more or less merit. For want of space

the author will here describe but three operations which have been most satisfactory in his experience:

The Holden perineorrhaphy is based upon the principle first advocated by C. P. Noble in 1897, that of approximating the borders of the levator ani muscles. The following is a quotation from the original paper of Holden:[1]

"The area of denudation is triangular in shape on the vaginal surface, the apex of the triangle being from 4 to 6 cm. from the outlet in the median line. From this point the denudation runs out to the lower

FIG. 520



Repair of an incomplete laceration of the perineum. Holden's modification of Noble's operation. Area of denudation exposing the separated levator ani muscle. Step 1.

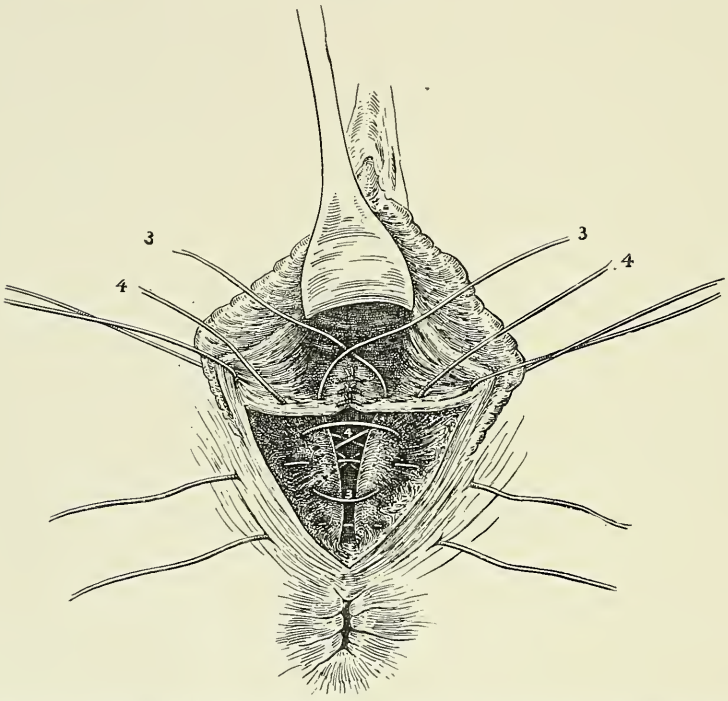
part of the remains of the hymen, the upper and outer lateral limit being about the same as in the Emmet operation. The external denudation is brought down to a point which is usually just above the position of the sphincter ani. The limits of the denudation are first marked out with the knife, then the vaginal mucosa is removed with the Emmet scissors.

"The border of the levator ani muscle on one side is now felt by palpation, with the finger just behind the ischiopubic ramus.

[1] Amer. Jour. Obstet., No. 33, vol. lii, p. 497.

"Under guidance of the palpating finger this broad edge of muscle is seized with the mouse-tooth dissecting forceps, through the overlying fascia and connective tissue, and is drawn out toward the median line. A round needle bearing a silk suture transfixes the fascia and muscle. The suture is not tied. The ends are clamped, and it is used to draw the muscle forward and make it prominent, when later in the operation it is necessary to pass sutures through the muscle. A second suture is next passed through the muscle of the opposite side in a similar manner.

FIG. 521



Repair of an incomplete laceration of the perineum. Apex of denuded area closed with interrupted chromic catgut sutures. Figure-of-eight sutures of chromic catgut or silkworm gut passed through the levator ani muscles and overlying vaginal walls and fascial structures. Step 2.

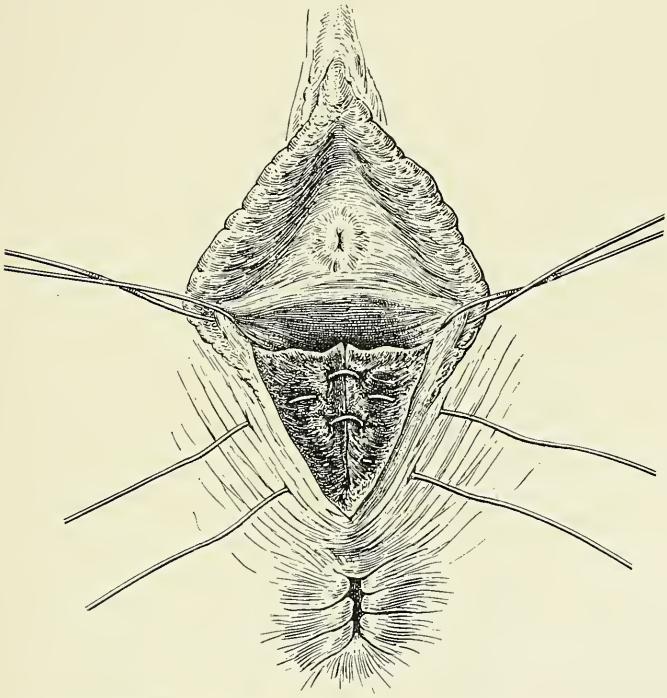
"The denudation of vaginal mucosa should, of course, extend high enough on the lateral walls of the vagina to allow the muscles to be brought together easily in the median line.

"Two external sutures of silkworm gut are now introduced, as shown in Fig. 520. Each suture passes first through skin and subcutaneous tissue, through the levator ani on the same side, then through the opposite muscle from before backward, and finally out through the skin and subcutaneous tissue on that side. When the needle is passed through the levator ani, an assistant pulls on the silk traction suture which has previously been passed through the muscle, making

it stand out, and a deep bite can be taken, passing through the entire muscle.

"The lowest suture is put near the rectum, the left forefinger of the operator pushing the rectum down so that it is not injured. The second suture is placed about 2 cm. above the first suture. When these two sutures are drawn tight, the borders of the two muscles are closely approximated, as are also the edges of the skin incision. The muscles are also held firmly against the skin and subcutaneous tissue.

FIG. 522



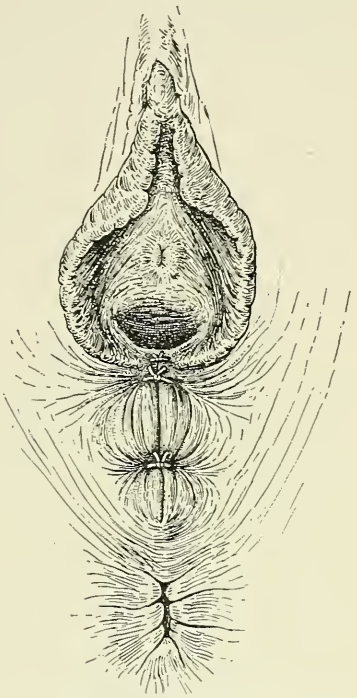
Repair of an incomplete laceration of the perineum. Figure-of-eight sutures drawn taut, thereby approximating the levator ani muscles. Step 3.

"The silkworm-gut sutures are not tied until after the internal stitches are placed and tied. The temporary traction sutures through the muscles may now be removed if desired, as the muscles are well splinted out and rendered sufficiently prominent by the silkworm-gut sutures. The first internal stitches are of plain catgut and begin at the apex of the triangle. Three or four stitches are usually taken, uniting the cut edges of the mucosa and catching enough of the denuded surface between to prevent leaving any dead space and to stop all bleeding.

"The figure-of-eight stitch which is next placed is best understood by referring to Fig. 521.

"Formalin or chromic catgut is used. The stitch starts on the right-hand side, passes through mucosa and underlying tissue to the posterior surface of the muscle. Without touching the muscle of that side it is carried to the opposite side and pierces that muscle from

FIG. 523



Repair of incomplete laceration of the perineum. Figure-of-eight sutures tied and two interrupted sutures of silkworm gut or chromic catgut approximating the superficial structures of the perineum. Operation complete. Step 4.

FIG. 524

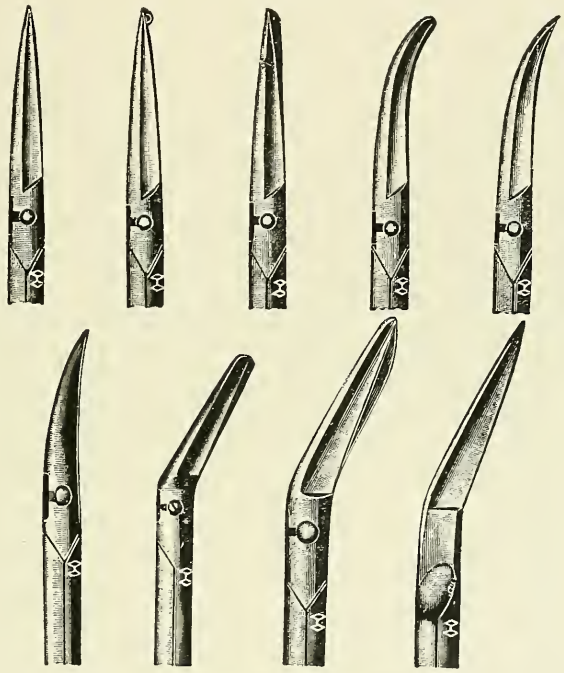
Mayo dissecting scissors.

behind forward. Then it passes to the anterior surface of the muscle on the first side and passes through that from before backward. Finally passing to the second side it is brought out through the mucosa and underlying tissue in the same way as it entered on the first side. Two

such stitches are inserted. The first one pierces the muscles between the two silkworm-gut sutures, the second goes through the muscles above the uppermost silkworm-gut stitch.

"By tying these two figure-of-eight sutures the borders of the levator ani muscles are brought together, the cut edges of the vaginal mucosa are neatly approximated, and the mucosa as a whole is bound down firmly to the posterior surface of the muscles. A muscular wall is built up and the posterior portion covered with mucosa; the anterior surface is as yet bare.

FIG. 525



Emmet's angular uterine scissors.

"By tying the silkworm-gut sutures the anterior part of the muscular perineal wall is covered by skin and subcutaneous tissue, the muscles are still more closely approximated, and are firmly bound to their covering of subcutaneous tissue and skin in front. One or two superficial stitches of plain catgut are sometimes necessary to approximate the skin or mucosa at the upper part of the wound."

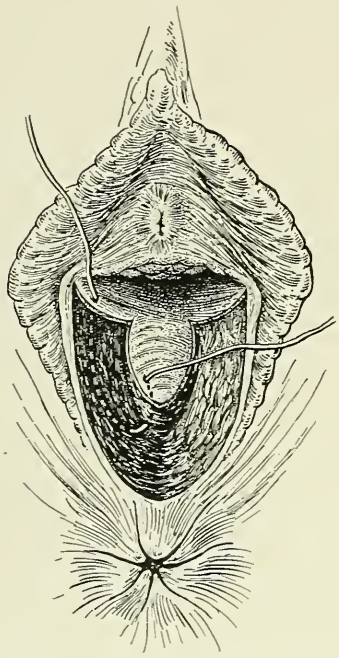
The advantages of this operation are:

1. Simplicity.
2. Little loss of blood.
3. No dead spaces left.
4. No buried sutures which are liable to infection.
5. The rectocele is pushed back of the perineal body.

The Emmet Operation for Incomplete Laceration of the Perineum.—This operation, while less simple in execution, gives most excellent results and will probably remain as a classical procedure.

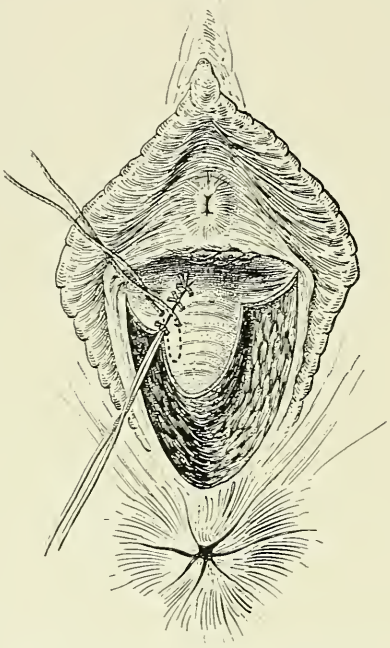
The limits of denudation are first defined by grasping either end of the divided carunculæ with tenacula and approximating them in the median line (Fig. 515). These points of fixation mark the upper lateral limits of the area to be denuded.

Fig. 526



Repair of an incomplete laceration of the perineum. (Emmet.) Area of denudation, with suture of chromic catgut passed through the lateral sulcus. Step 1.

Fig. 527



Repair of an incomplete laceration of the perineum. Right lateral sulcus closed with chromic catgut sutures. Step 2.

A third tenaculum grasps the crest of the rectocele in the median line and with it traction is made downward, while the assistants retract the lateral angles outward. In this manner the three angles of the triangle of denudation are outlined.

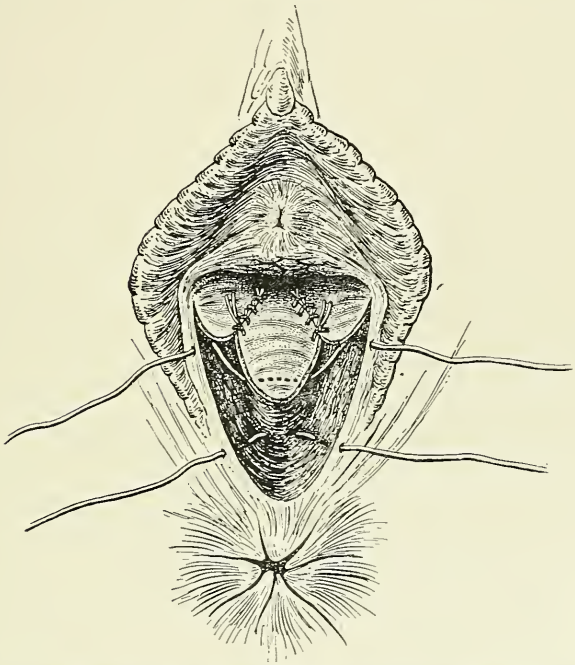
The process of denudation is then continued by first connecting these three angles, using a sharp scalpel and cutting through the vaginal mucosa. The bloody lines clearly indicate the outlines of the triangle, which should now be denuded with angular scissors. The central tenaculum and one of the lateral tenacula are drawn downward and outward, thereby exposing one of the vaginal sulci. The upper limit of the sulcus marks the extent of the area of denudation, and from this

point the knife is drawn downward and outward to the lateral tenaculum, and again downward to the tenaculum at the crest of the rectocele. The intervening space is denuded.

A similar process is carried out on the other side, thus forming two triangular areas of denudation, one on either side of the rectocele.

A triangular undenuded area remains between these two triangles, as shown in Fig. 526.

Fig. 528



Repair of an incomplete laceration of the perineum. Both lateral sulci closed by sutures of chromic catgut and crown stitch of silkworm-gut placed. Step 3.

All scar tissue below is then dissected off with angular scissors. This dissection is done by sweeping in a semicircle around the posterior wall.

The tissues are now so approximated with sutures as to cover all denuded surfaces and to restore the perineal structures to their original positions and functions.

From the apex of the lateral triangles, No. 2 ten-day chromic catgut is placed and the lateral margins of the triangles united as seen in Fig. 527.

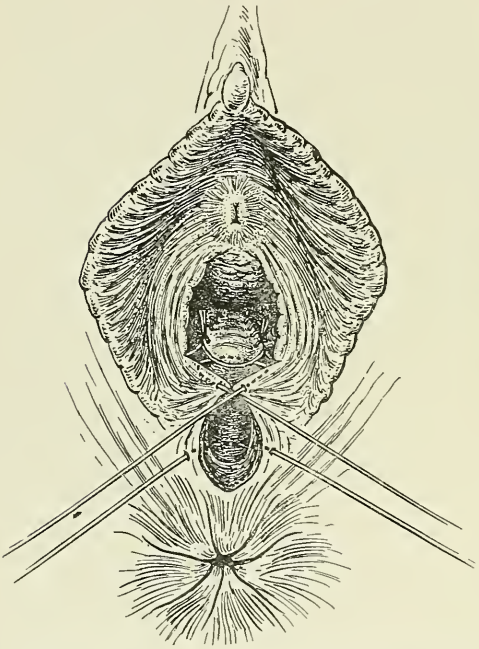
The crown stitch of silkworm gut is next passed from one end of the divided carunculæ downward and inward to the apex of the undenuded triangle, then upward and outward to the other end of the divided carunculæ. This suture is tied, and by so doing the outlet is restored (Fig. 528 and 529).

From this point downward interrupted silkworm-gut sutures are passed and tied, thereby completing the operation (Fig. 530).

Tait's Operation.—The following description of Tait's operation is given by George H. Noble:[1]

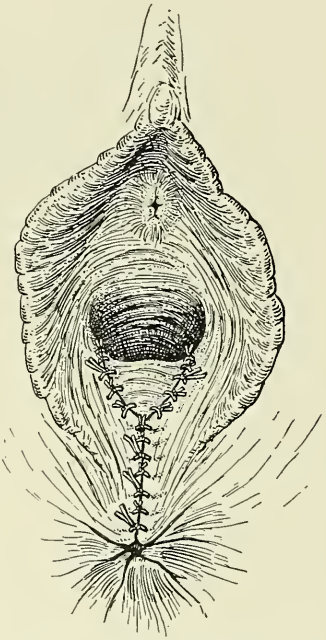
"In the H-operation he made a 'real flap of mucous membrane.' There seems to be some discrepancy in the details of the various authors describing these operations, and as Tait has complained of 'most inextricable' confusion arising from this source, the following account is condensed from McKay's description, to which the originator gave his unqualified endorsement.

FIG. 529



Emmet's operation. Repair of an incomplete laceration of the perineum. Traction made upon the crown stitch to demonstrate the effect of the operation. Step 4.

FIG. 530



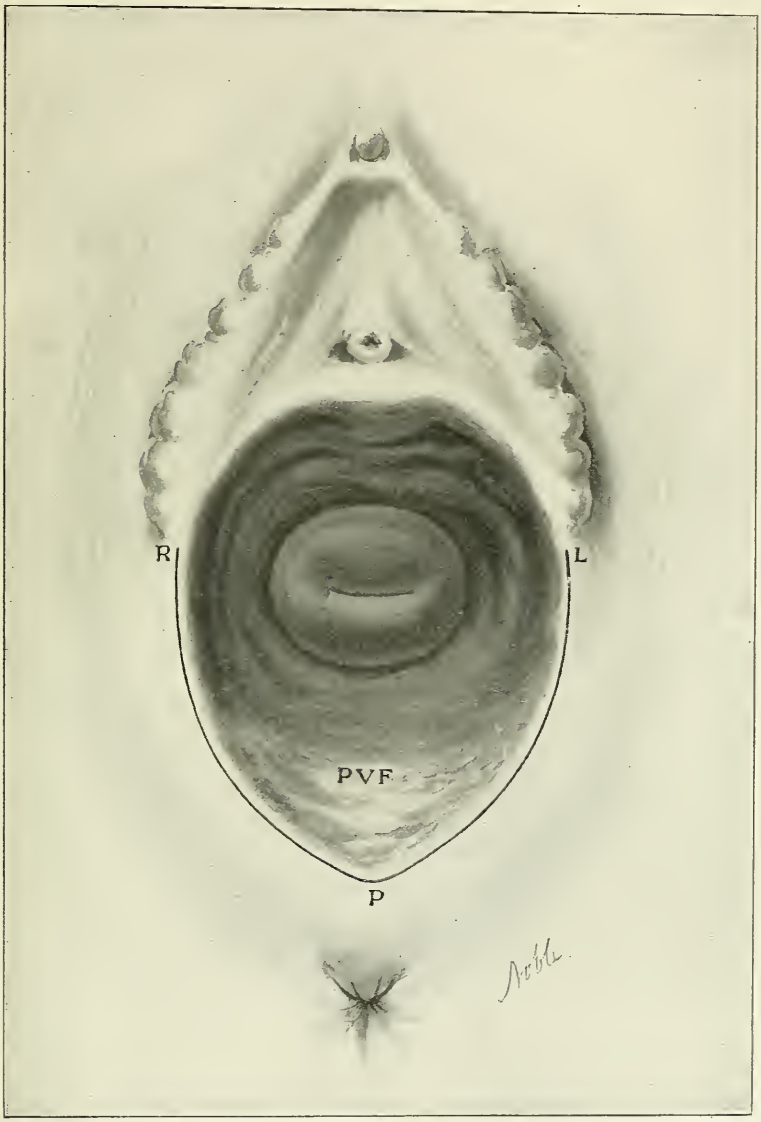
Emmet's operation. Repair of an incomplete laceration of the perineum. Stitches tied. Operation completed. Step 5.

"*First Step.*—With two fingers in the rectum as a guide, a short vertical nick is made in the margin of skin and mucous membrane in the medial line just in front of the anus at *P*, Fig. 531. At this point the sharp point of the scissors is forced three-fourths of an inch into the tissue and an incision is made along the junction of skin and mucous membrane, to the right side of the vaginal orifice to a point marked *R*,

[1] Bovée's Practice of Gynecology, first edition, p. 210.

just posterior to the inferior extremity of the labium minus. The opposite side is incised in the same way to the point marked *L*.

Fig. 531

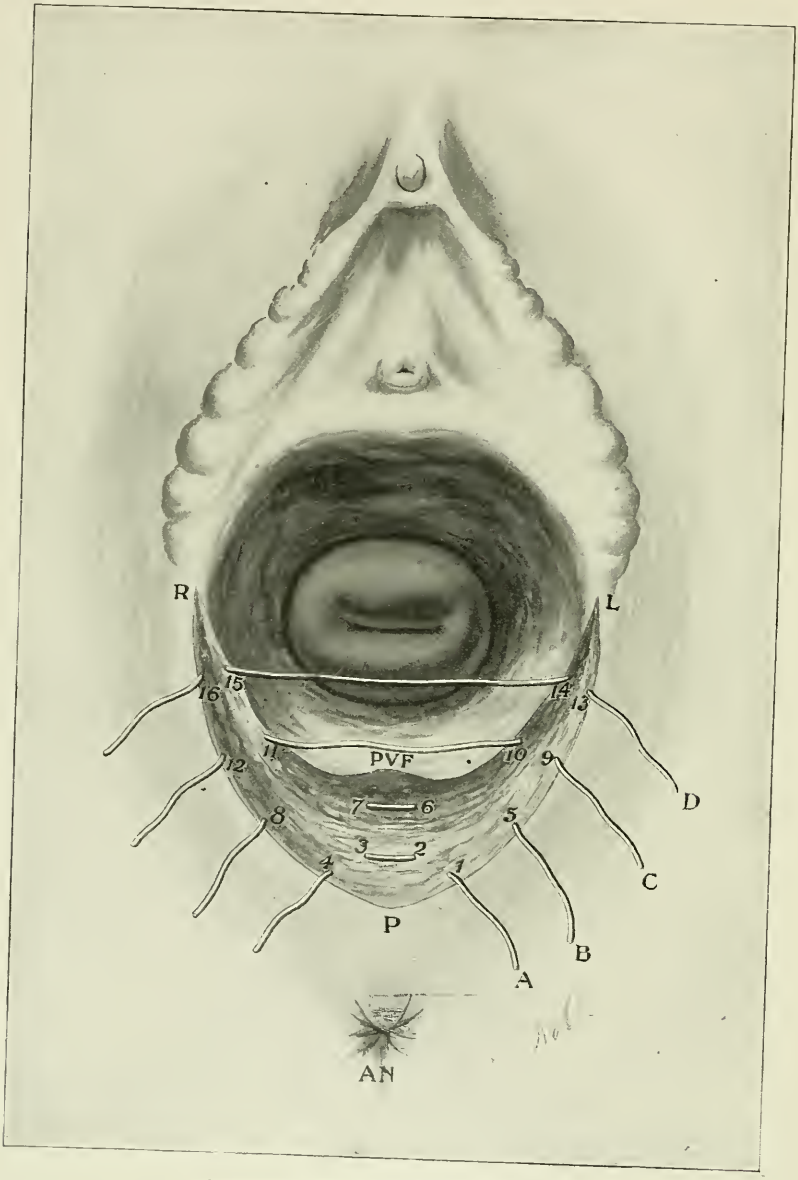


Tait's operation for incomplete tear of the perineum: *L P R*, line of incision; *P V F*, posterior vaginal flap; *P*, perineum.

"*Second Step.*—The raw V-shaped surface made by the incision is slightly increased by carefully snipping along the edges of the imperfect

vaginal flap *P V F*, which retracts more and more as it is cut, widening the denudation. Tait says, most emphatically, that this surface (*R L P*)

FIG. 532



Same as Fig. 531, with sutures introduced.

should not be a large one, and he seldom does more than make the primary incision.

"*Third Step.*—A needle on a handle is used, the point entering just inside the skin margin at 1 (Fig. 532); emerges in the raw surface near the median line at 2, reënters a corresponding point at 3, and emerges just inside the skin edge at 4. The needle is then threaded with silkworm gut, and withdrawal pulls the suture into place. The second suture is introduced in the same way, entering the needle at 5, out at 6, in again at 7, and out at 8; thus, the two lower sutures are introduced with one sweep of the needle; the two upper ones require two passes of the needle. The needle is inserted at 9, emerges at 10, is threaded and withdrawn. It penetrates again at 12, emerges at 11, is threaded with the other end of the suture, which is drawn across in front of the posterior vaginal flap, and out at point of entry. The last and topmost suture is passed in the same way at points marked by the figures 13, 14, 15, and 16. Each end of the sutures is secured with catch forceps to prevent accidental withdrawal.

"*Fourth Step.*—The forceps holding the ends of the upper sutures *B C D* are turned up over the mons and held by an assistant, and the wound irrigated, sponged, and spurting vessels secured. An assistant then presses the buttocks together as the lower suture *A* is gently drawn upon and tied. The second suture *D* is tied in the same way. The assistant presses the sides *R L* strongly together while the operator ties sutures *B* and *C*. Should too much cutting be done in the process of dissection and a 'real flap' be formed, it is left to take care of itself."

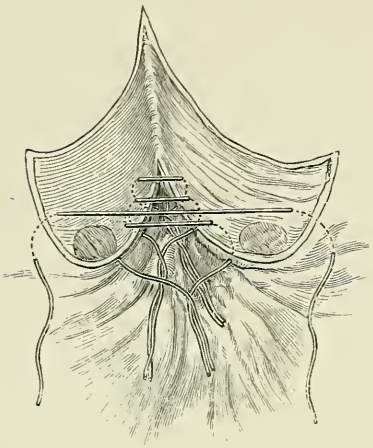
Immediate Repair of a Complete Laceration of the Perineum.—A complete tear of the perineum starts at the fourchette and extends back in the median line of the perineum, through the sphincter ani muscle, and involves more or less of the rectovaginal septum. Because of the resulting incontinence of feces, a complete laceration should be repaired at the completion of labor. However, Hearst advocates waiting until the tenth day of the puerperium, believing that he can be more certain of getting good results.

Technic of Operation.—A general anesthetic is given and the patient placed in the lithotomy position. The field of operation is prepared in the usual manner. The first step is to find the divided ends of the sphincter muscle and approximate them. If the rectovaginal septum is torn above the sphincter, the margins of the rectal wall are first approximated with buried chromic catgut sutures No. 2. The sutures are placed at intervals of one-fourth of an inch until the sphincter muscle is reached. All sutures are introduced on the rectal side of the rupture and should penetrate the septum deeply enough to insure a firm hold. Next the divided ends of the sphincter muscle are approximated by two chromic catgut sutures, taking care that the sutures are not tied too tightly. It is well to reinforce the catgut sutures by one or two silkworm-gut sutures. From this point on the operation is similar to that described above under Immediate Repair of an Incomplete Laceration.

After-treatment.—The perineum should be protected by a sterile pad of surgical gauze and held in place by a T-binder. The patient

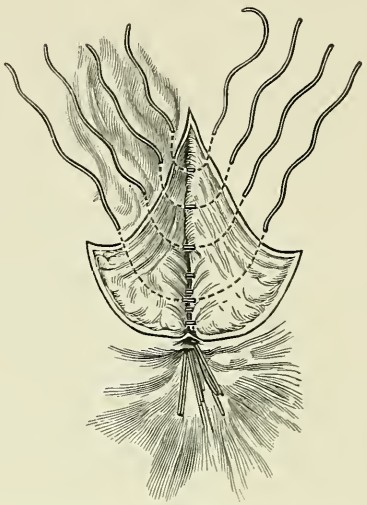
should be encouraged to urinate, and only when this is impossible should the catheter be passed. After urinating, the vulva should be douched

Fig. 533



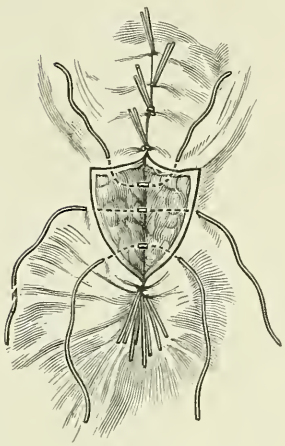
Complete tear; closing the rent in the bowel.

Fig. 534



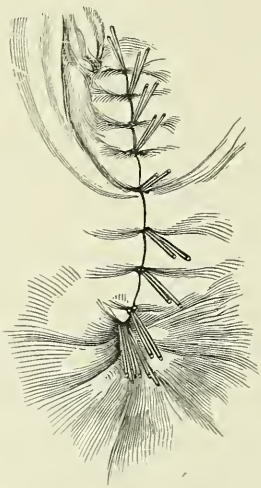
Deep interrupted, lifting sutures in position.

Fig. 535



All sutures laid; vaginal sutures tied.

Fig. 536

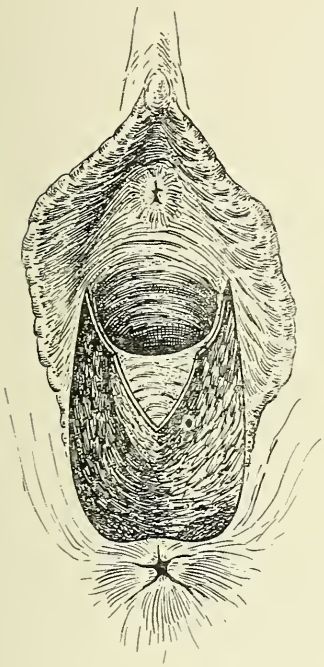


Internal and external sutures tied.

with an antiseptic solution, such as a 1 per cent. lysol solution. When possible the bowels should be locked for at least four days, and the

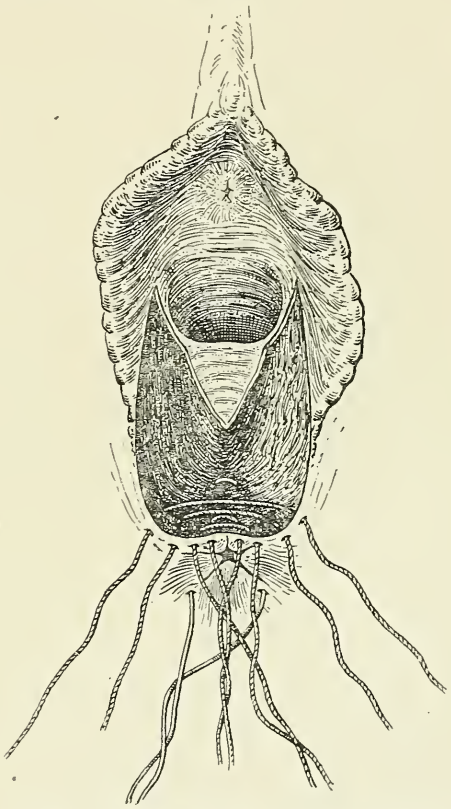
author has been able to make the patient comfortable for at least eight days before opening the bowels. To open the bowels two ounces of castor oil should be given, this to be followed in four to six hours with an enema of sweet oil. It is best for the surgeon or a competent assistant to give the enema, rather than to trust it to a nurse, for fear that the rectal tube may disturb the sutures. The patient should

Fig. 537



Emmet's operation. Rupture of the rectovaginal septum. Complete laceration of the perineum. Area of denudation. Ends of divided sphincter muscle exposed. Step 1.

Fig. 538



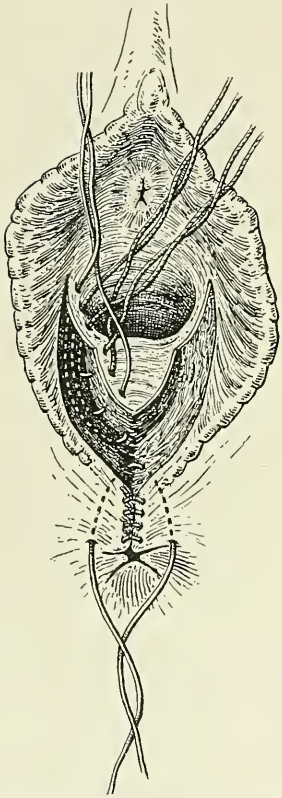
Emmet's operation. Rupture of the rectovaginal septum. Complete laceration of the perineum. Linen sutures transfix the divided ends of the sphincter muscle. Step 2.

remain in bed two weeks. The diet should be light. Antiseptic vaginal douches should be given daily after the seventh day. Close inspection should be kept of the stitches, and if the tissues appear irritated, the author generally elevates the hips on pillows at the foot of the bed and keeps a pool of lysol or creolin solution (0.5 per cent.) in the vagina and a wet antiseptic pad over the perineum. In this way he succeeds

in averting a failure to get union. The silkworm-gut sutures are removed on the tenth day of the operation.

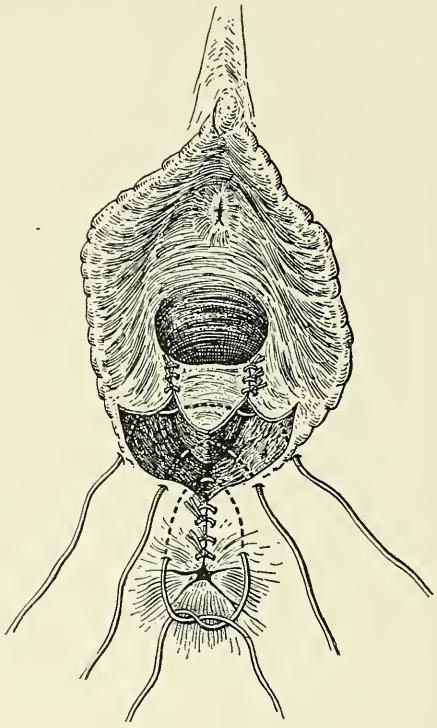
Late Repair of a Complete Rupture of the Rectovaginal Septum.—*Emmet's Operation* (Modified by Kelly).—*Step* 1.—An incision is made across the septum at the junction of the rectal and vaginal mucosa and is carried to a point above and beyond the sphincter

Fig. 539



Emmet's operation. Rupture of the rectovaginal septum. Complete laceration of the perineum. Chromic catgut sutures are passed on either side of the rectocele, thereby approximating the margins of the denuded areas above. Step 3.

Fig. 540

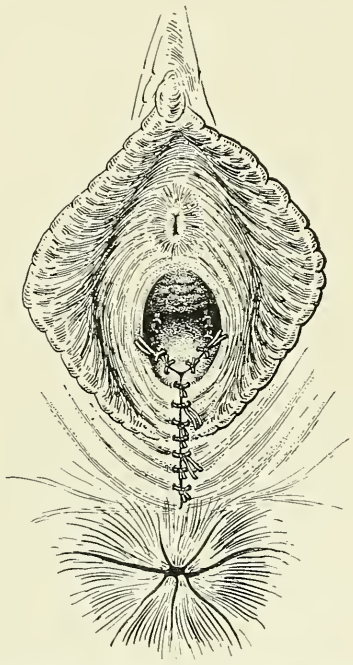


Emmet's operation. Rupture of the rectovaginal septum. Complete laceration of the perineum. Passing of the crown stitch of linen or silkworm gut. Step 4.

ends. The operation proceeds as in an ordinary relaxed vaginal outlet (Fig. 540). With the area of denudation completed to form bilateral triangles in the sulci and a tongue of undenuded tissue intervening between the denuded sulci, the operator proceeds to expose the severed ends of the sphincter muscles.

Step 2.—The index finger of the left hand is inserted into the rectum and the septum drawn gently forward. The internal sphincter muscle is carefully dissected and its ends liberated. In exposing the sphincter ends a flap of undenuded tissue is formed which serves to protect the wound from the rectal surface. To prevent the leaving of a dead space in the centre of the septum, three or four figure-of-8 chromic catgut sutures are passed, first through the fibers of the sphincter muscle, next to the opposite side, and from this point to the tissues in the septum at a point somewhat above the sphincter. The suture is then carried to the first side, where it passes through corresponding areas of tissue and is brought through the internal sphincter at the point of entrance. This suture will be found buried when the operation is complete. Two or three additional sutures are passed in a similar manner, and when brought together in the middle line the dead space is effectually obliterated.

Fig. 541



Emmet's operation. Rupture of the recto-vaginal septum. Complete laceration of the perineum. All sutures tied. Operation completed. Step 5.

Step 3.—The margins of the triangles are next approximated with chromic catgut and the perineal wound is closed with interrupted silkworm-gut sutures.

Step 4.—The apron of tissue protruding from the rectum is transfixed by silkworm-gut sutures, with the ends left long and fixed to the buttocks by a strip of adhesive plaster, as suggested by Kelly.

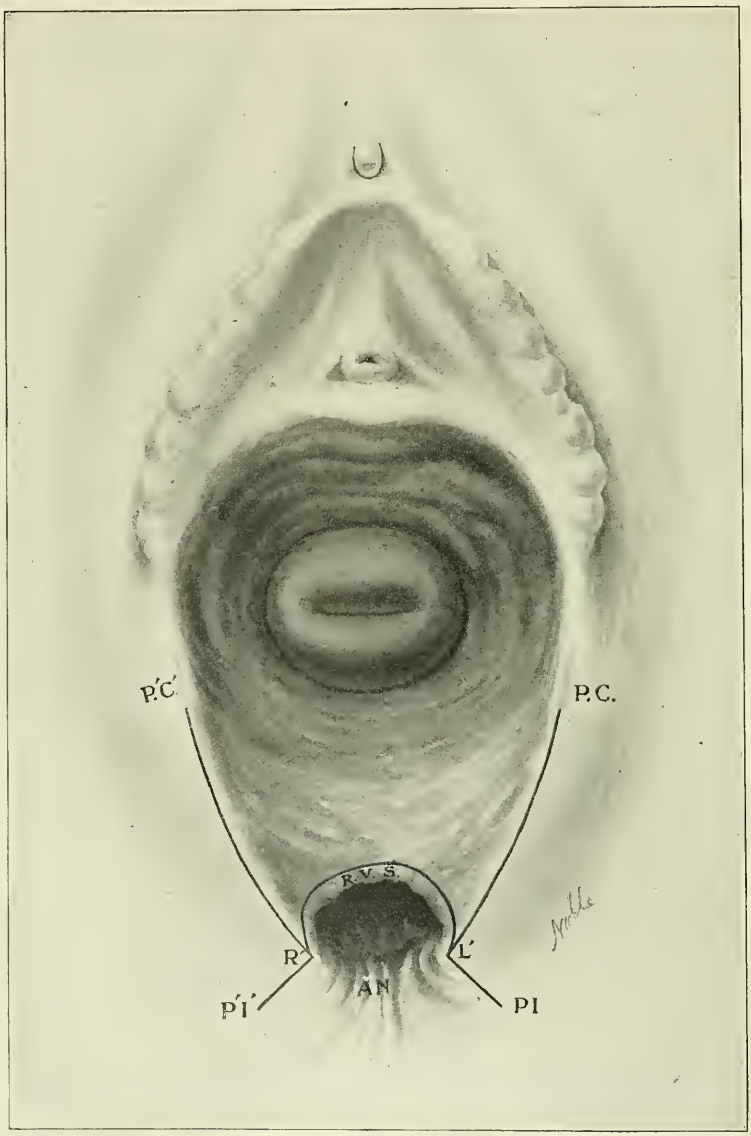
Tait's Flap-splitting Operation ("*H Operation*").—George H. Noble[1] gives the following abstract of McKay's description of Tait's operation for complete laceration of the perineum. The description of McKay is approved by Tait:

"*Step* 1.—The scissors enter at *L'* (Fig. 542) (sphincter dimple of Emmet) to a depth of half an inch, then follow the edge of the recto-vaginal septum to the opposite sphincter, dimple *R'*. From these two points incisions are made in an upward direction along the muco-cutaneous margin to the original site of the posterior commissure (*P C* and *P'C'*). Then an incision is made on each side, beginning

[1] Bovée's Practice of Gynecology, p. 214.

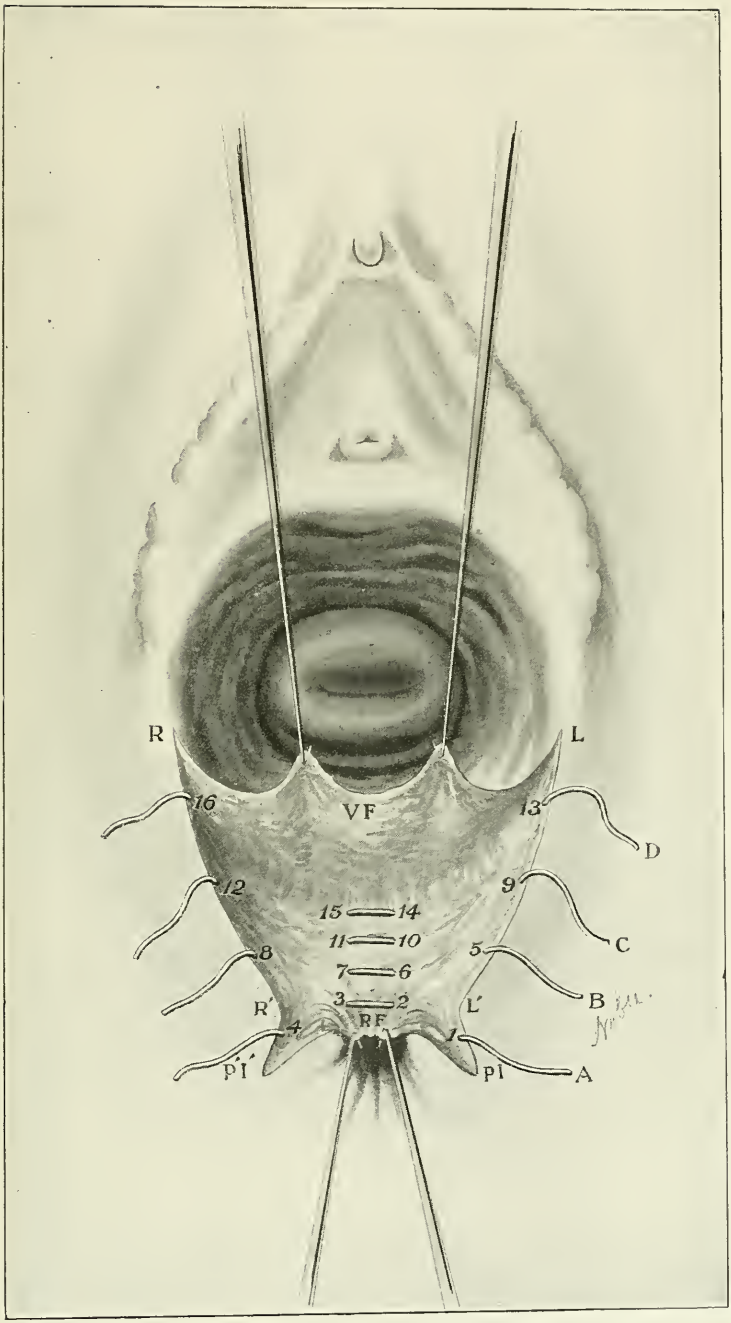
at the sphincter dimple, cutting downward and outward to *PI* and *P′I′*. These should be made sufficiently deep to expose the ends of the sphincter muscles.

Fig. 542



Tait's operation for complete tear of perineum: *P C L′* and *P′ C′ R′*, lateral incisions; *L′ R′*, incision of rectovaginal septum; *L′ P I*, left posterior incision; *R′ P′ I′*, right posterior incision; *A N*, anus *R V S*, rectovaginal septum.

Fig. 543



Insertion of sutures in Tait's operation for complete laceration of the perineum.

"*Step* 2.—The posterior vaginal flap *R, VF, L* (Fig. 543) forms a W-shaped surface which is increased by further dissection of the flap, snipping underneath as it is held up until a 'fairly large surface, shaped like a letter H,' is formed.

"*Step* 3.—Two hooks are inserted into each flap, the rectal and vaginal; the former is held up out of the way while the latter is drawn downward in the direction of the anus, making as it were a rectal flap. The sutures are placed in two passes of the needle. It enters the raw surface at a point marked 1 in the angle of the extremity of the posterior incision *P I* (on patient's left), just inside of the edge of the skin, emerges in the raw surface near the median line at 2, crosses just over this line to 3, when it again enters the raw surface, emerging at 4. The needle is then threaded, and on being withdrawn it pulls the suture into place and its ends are secured with a catch forceps. The other sutures are introduced in the same way; for instance, for suture *B* the needle enters at 5, out at 6, in at 7, and emerges at 8.

"*Step* 4.—The forceps holding the three upper sutures (*B, C, D*) are turned over the mons and held by an assistant. The field of operation is then irrigated, sponged, and spurting vessels secured. An assistant presses the buttocks together as the lower suture *A* is gently drawn upon and tied, while another assistant draws downward the rectal flap. Each suture is tied in the same way from below upward. The vaginal flap is left to find its own place against the vaginal surface of the newly made perineum, to which it becomes adherent."

REPAIR OF THE SPHINCTER ANI MUSCLE

The sphincter ani muscle may be torn without injury to the structures lying above. Kelly's operation for this condition consists in making a semicircular incision around the anterior margin of the anus just outside the border of the sphincter. The skin is deflected outward. The divided ends of the sphincter are sought, and in the search it may be necessary to extend the incision. These ends are liberated a sufficient distance to permit of their approximation without undue tension. The ends of the muscles are united with three buried catgut sutures, and the skin is made to cover the muscle by the insertion of silk sutures.

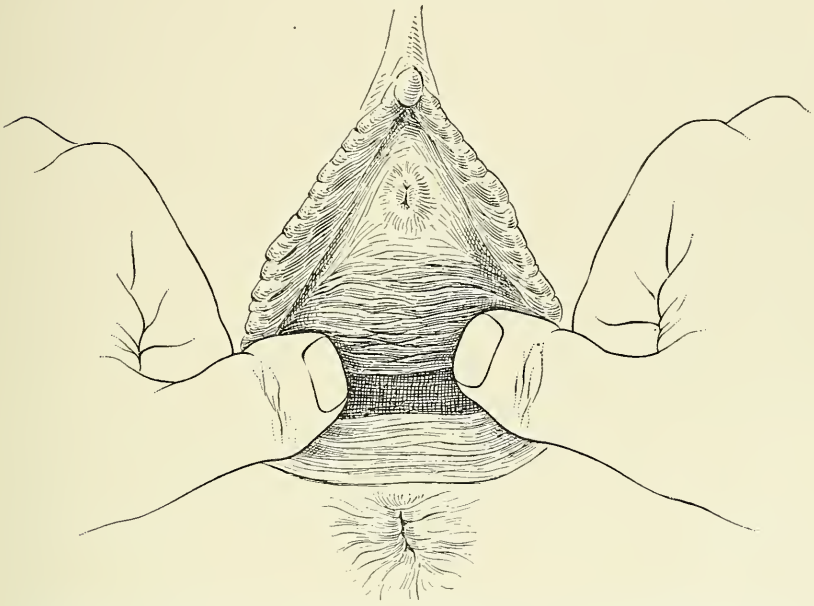
A tension suture of silkworm gut is passed through the skin to the outer limit of the incision and tranfixes the sphincter muscle external to the catgut sutures, then passes out from the skin surface at a point corresponding to its entrance. This is placed before the skin is sutured, and is tied after the skin is united.

RELAXED OUTLET OF THE RECTOVAGINAL SEPTUM

The supporting structures of the pelvic floor and vaginal walls may be so stretched by repeated childbearing as to afford little support

to the uterus. This may be true in the absence of lacerations. The anterior and posterior and even the lateral walls of the vagina are relaxed and may protrude. While the perineum is normal in its extent, and may even be greater than the normal dimensions through stretching, the examining finger readily demonstrates its laxity and condemns it as an efficient supporting body. The levator fibers are greatly relaxed and lie parallel to the lateral walls of the vagina.

FIG. 544



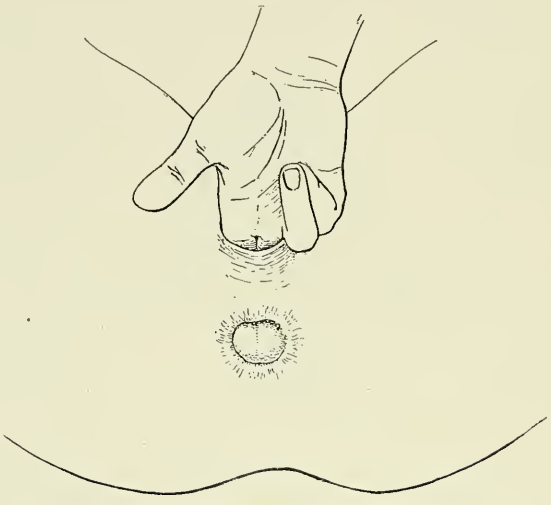
Relaxation of the pelvic floor. The thumbs inserted laterally in the vagina demonstrate the loss of retaining power.

The extent of relaxation may be demonstrated by inspection. With the patient in the dorsal position, she is directed to strain. This effort causes the outlet to gap and to expose the protruding walls of the vagina. A finger against the cervix will note the descent of the uterus during the act of straining. The perineum is felt as a thin partition—an altogether inadequate support to the uterus. There is also noted an absence of the well-developed levator fibers stretching from one ramus of the pubis to the other, and in the place of this firm diaphragm there is a sharp-edged, lax loop of fibers. Such a condition is as imperative an indication for repair as an incomplete laceration of the perineum.

Operation.—For the restoration of a relaxed outlet the operation advised for incomplete lacerations is most serviceable. The operation of Holden for simplicity and effectiveness is admirable. (See page 769.)

After-treatment of Plastic Operations on the Pelvic Floor.—It is not necessary to keep the patient's knees pinioned after she has regained consciousness. She may be permitted to change her position in bed at her own volition. After urinating, the perineum should be douched with an antiseptic solution, preferably lysol or creolin, 1 to 200, and a fresh sterile pad applied. The bladder should not be catheterized if it can be avoided, for fear of creating cystitis.

FIG. 545



Relaxation of the pelvic floor and sphincter ani.

The bowels should be opened on the fourth day. The author usually administers a half-ounce to an ounce of castor oil, followed in six hours by an enema. When the sphincter has been repaired he generally orders a sweet oil or glycerin enema. When the sphincter is not involved it is his custom to order a compound enema composed of 1 ounce of salts, 1 ounce of glycerin, and 3 ounces of sweet oil. If there is much gas in the bowel, 1 dram of turpentine may be added to the enema.

The stitches are removed on the tenth to the fourteenth day, and the patient allowed to sit up.

The author has recently followed the suggestion of John G. Clark in discarding silkworm-gut sutures for subcutaneous chromic catgut in uniting the skin margins of the perineum. This gives great comfort to the patient, and affords adequate support.

WOUNDS OF THE VAGINA

Etiology.—Lacerations and contusions of the vaginal walls are not rare. They are usually the result of labor, coitus, and external violence.

1. **Labor.**—Injuries to the vaginal walls are the result of labor, and are due to tearing of the tissues and to pressure leading to contusion and sloughing of the tissues. An impacted head may lead to pressure necrosis of the vaginal walls and the subsequent development of fistulæ communicating with the bladder or rectum. The faulty application of the obstetric forceps may lacerate the vaginal walls, and such lacerations are known to extend into the bladder, rectum, broad ligaments, and peritoneal cavity. The forcible overstretching of the vagina by the hand in performing a podalic version is known to produce similar lacerations.

2. **Coitus.**—In the young and aged coitus is known to produce extensive lacerations of the vaginal walls. All congenital and acquired constrictions of the vagina predispose the vaginal walls to injury in coitus.

3. **External Violence.**—Foreign bodies, such as splinters of wood, have been known to penetrate the vagina. The author has seen perforations of the vaginal wall by a probe in the hands of the patient, and instances are not rare in which the surgeon has accidentally injured the vaginal walls with instruments. Foreign bodies, notably pessaries, are known to cause pressure necrosis leading to ulceration, cicatrization, and to perforation into the bladder and bowel.

Symptoms.—The symptoms depend upon the location and extent of the injury. A small wound may be unnoticed. When occurring in labor the symptoms are often masked by associated lesions. The symptoms common to injuries to the vaginal walls are pain, hemorrhage, and impaired functions of the neighboring organs.

The pain is of short duration and the bleeding is seldom profuse. When the bladder and rectum are injured their functions are disturbed. There may be incontinence or retention of urine; urination may be painful and blood may appear in the urine. Likewise in injuries to the wall of the rectum there may be incontinence of feces, from the development of a rectovaginal fistula, and the bowel movements may be painful and bloody.

Results of Injuries to the Vaginal Walls.—As the results of injury to the vaginal walls, the following conditions are known to arise: shock, sepsis, serious and even fatal hemorrhage, rectovaginal fistula, vesicovaginal fistula, ileovaginal fistula, vaginal hernia, and peritonitis.

Treatment.—After the completion of labor it is imperative to carefully inspect the vaginal walls, and if found lacerated the wound should be immediately repaired. With the patient in the lithotomy position the vaginal walls can be readily inspected by inserting a vaginal retractor.

Hemorrhage is controlled by packing the vagina with sterile gauze. When this does not suffice to control the bleeding, the wound should be exposed by a vaginal retractor and the bleeding-points secured by suturing the margins of the wound, either with silkworm gut or chromic catgut. The possibility of injury to the bladder, rectum, and peritoneum must be borne in mind and a careful inspection made to determine not only the points of bleeding but also the extent of the wound. If

the peritoneal cavity is invaded, no vaginal douches should be given for fear of contaminating the peritoneal cavity. When the peritoneal cavity is invaded, the wound leading to the peritoneal cavity should be drained with iodoform gauze, and under no circumstances should it be sutured. All clean-cut wounds should be closed by interrupted silkworm or chromic catgut sutures. When the tissues are badly contused it is not wise to suture the wound. In this event the wound should be packed loosely with iodoform gauze and allowed to heal by granulations. The vulva should be protected by a sterile gauze pad, held in place by a T-binder. Rest in bed should be enjoined for at least one week.

ACQUIRED STENOSIS AND ATRESIA OF THE VAGINA

The lumen of the vagina may be partially or wholly constricted as the result of injury.

Etiology.—Operations.—The vagina may be constricted by the operator in the performance of plastic operations upon the vaginal walls.

Ulcerations.—Ulcers with subsequent cicatrization may result in stenosis of the vagina. These ulcers are due to neglected and badly fitting pessaries, to pressure necrosis from the fetal head, to caustic applications to the vaginal walls, and to infectious diseases, such as syphilis, typhoid fever, diphtheria, and scarlet fever.

Lacerations.—Lacerations are due to causes enumerated on page 789.

Symptoms.—If the atresia is complete and the patient is in the period of sexual activity, there will be an obstruction to the menstrual flow, and interference with sexual intercourse. In both early and late life there may be no complaint arising from the condition.

The lesion is recognized by inspection and palpation. It is seldom necessary to give an anesthetic in making the diagnosis.

Treatment.—The patient is anesthetized and placed in the lithotomy position. In some instances it is possible to remove the obstruction by stretching the vaginal walls with the fingers and preventing the recurrence of adhesions by packing the vagina with iodoform gauze. Such packs should be removed every other day and the vagina douched with an antiseptic solution before repacking.

Firm bands of adhesions may be cut with scissors and the raw surfaces cauterized or stitched in a line paralleling the long axis of the vagina. When the cicatricial tissue is dense it may be necessary to make multiple parallel incision into the cicatricial tissue and to slowly dilate the stricture with hard-rubber bougies, after which a glass plug is inserted and held in place by a T-binder until the incisions are healed. Because of the liability of recurrence the patient should wear this plug two or more hours a day for months, and if necessary for years. In far-advanced cases it may be advisable to incise the cicatrix at intervals of days or weeks to avoid too extensive trauma.

WOUNDS OF THE CERVIX

Wounds of the cervix are of special import because of their alleged relation to cancer of the cervix. However, it has not been conclusively proved that lacerations of the cervix bear a causal relation to cancer, though the evidence is highly suggestive. While it is rare that cancer develops in the vaginal portion of a cervix which has not been previously injured through labor or instrumental dilatation, it must be admitted that there are comparatively few women who reach the cancer period of life whose cervix has not been dilated either in labor or by instruments. This being true we would naturally find a small percentage of cancer of the cervix in previously injured cervices.

Etiology.—Labor.—Labor is by far the most frequent cause of injury to the cervix. It may be stated that the cervix is torn to a greater or lesser extent in every labor. Small tears have no clinical bearing and do not need operative interference. The cervix is often torn in meddlesome obstetrics. Undue hastening of the first and second stages of labor subject the cervix to injury. In this connection we refer to hurried manual dilatation of the cervix, to the administration of ergot in the second stage, to roughness in performing podalic version, to the faulty application of the forceps, to the effort to deliver the child through a cervix that is not completely dilated, and to the premature rupture of the bag of waters.

Even extensive lacerations of the cervix may be unavoidable. This is true of precipitate labors and to a certain extent when the cervix is unyielding. Old primiparæ are particularly liable to extensive tears because of the rigidity of the cervix. Delivery of a child through a cancerous cervix may result in extensive tears with alarming hemorrhage. In retarded labor the prolonged pressure of the head may result in necrosis and extensive loss of tissue.

2. **Instrumental Interference.**—Hurried forcible dilatation of the cervix by instruments of divulsion is responsible for a large proportion of injuries to the cervix. In this manner the cervix may be torn into the broad ligaments.

Varieties.—We will here speak of three varieties of lacerations, that is, unilateral, bilateral, and multiple or stellate. The tears are more often found in the left side. The explanation for this lies in the predominance of the left occipito-anterior presentation of the fetal head.

We will also mention complete and incomplete lacerations. Incomplete lacerations usually escape notice, but may, nevertheless, afford an atrium for infection. Complete tears may completely divide the vaginal portion of the cervix into anterior and posterior lips, and may extend to the vaginal walls, bladder, and broad ligaments.

Associated Lesions.—A moderate degree of laceration will usually undergo spontaneous healing. When healing fails, the cervix usually becomes congested and inflamed. This interferes with the normal involution of the cervix following labor and leaves the cervix hard and

hypertrophied. In bilateral lacerations the lips become everted and expose the cervical mucosa; then erosions and cystic formations in the cervix will develop. (See page 416.)

A plug of scar tissue forms in the angle of the laceration. This tissue has been credited with exciting certain reflex disturbances. Vesicovaginal and ureterovaginal fistulæ are occasional results of extensive lacerations. Septic infection of the cervical wound may extend to the uterus and its appendages or to the cellular tissue of the broad ligament. Finally, it is asserted that cancer is prone to develop at the site of these lacerations, a statement that is not fully confirmed.

Symptoms.—Aside from the immediate hemorrhage which follows upon lacerations of the cervix, there are no symptoms which can be directly attributed to the laceration. The symptoms commonly ascribed to the lacerations are in reality due to the complicating lesions, that is, erosions, subinvolution, endometritis, and displacements of the uterus. These symptoms are leucorrhea, menstrual and intermenstrual hemorrhages, backache, sterility, the habit of abortion, and dysmenorrhea. As to reflex disturbances emanating from a lacerated cervix, the author is in doubt. When they exist he believes they are due to the associated lesions rather than to lacerations.

Diagnosis.—Palpation.—A laceration can be readily detected by the examining finger. The cervix is enlarged, club-shaped, the angle of laceration is readily felt, and the everted lips present to the finger the velvety mucous membrane. When there are distended cysts they are felt as shot under the skin. As a rule there is some tenderness on examination.

Inspection.—The patient is placed in the lithotomy position and the cervix exposed by a bivalve speculum.

To demonstrate the extent of laceration and to differentiate an eversion from an erosion, the two lips of the cervix are grasped with tenacula and approximated. In this manner the everted mucous membrane of the cervical canal disappears. Any erosion which may exist will still be in evidence outside the reconstructed external os. If the cervix is deeply infiltrated there will be difficulty in correcting the eversion by this means.

An incomplete tear is recognized by passing a sound into the cervical canal and noting the increased caliber of the cervical canal. The tip of the sound may be felt through the intact vaginal mucous membrane.

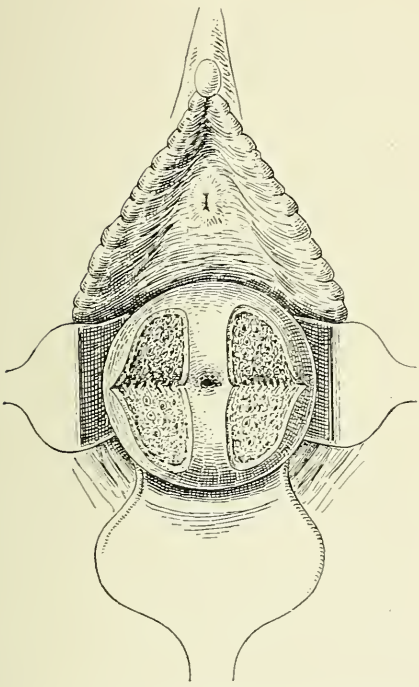
Differential Diagnosis.—A lacerated cervix with eversion of the lips is to be distinguished from cancer of the cervix and erosions. (See respective chapters.)

Treatment.—More than half of the lacerations of the cervix are to be regarded as physiological and demand no operative interference. Only when the lacerations are extensive or are associated with complicating lesions, such as erosions, eversions, and infection, should surgery be invoked.

IMMEDIATE REPAIR OF A LACERATED CERVIX

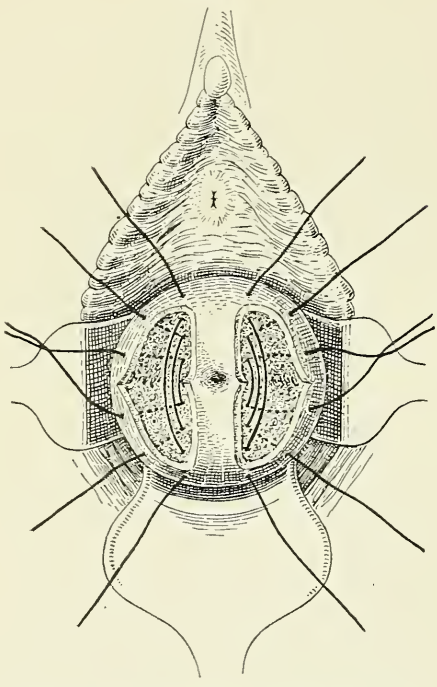
Only in event of uncontrollable hemorrhage from the circular artery should the cervix be repaired immediately after labor. In all cases of extensive laceration of the cervix, not accompanied by severe hemorrhage, the author prefers to suture the laceration about ten days after labor. At this time it is only necessary to scrape away the granulated tissue with a knife and unite the torn surfaces with interrupted sutures of No. 2 ten-day chromic catgut. In so doing an anesthetic is required. The first suture is passed near the apex of the wound, and additional sutures are passed at intervals of one-half inch. The sutures should be carried through the thickness of the cervix, not including the mucosa.

FIG. 546



Bilateral laceration of the cervix. The margins of the lacerations are denuded with scissors and the plugs of scar tissue in the apices are dissected out.

FIG. 547



Transverse sutures of No. 2 chromic catgut are passed from before backward, beginning at the apex.

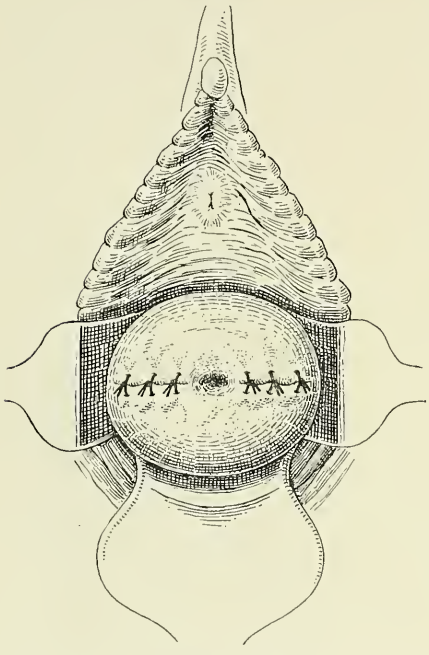
The patient should remain in bed about five days, after which she may be allowed to attend to her usual duties. Vaginal antiseptic douches should be given daily after the first week of the operation.

Unsuspected lacerations will be discovered and much trouble averted if the profession would adopt the custom of making a vaginal examination of all cases about the tenth day of the puerperium.

Late Operation.—Preliminary Treatment.—Certain complications, resident in the cervix and in the uterus and its appendages, may require treatment before resorting to a repair of the cervical tear. When the cervix and neighboring structures are congested, hot vaginal douches, glycerin and ichthyol tampons, and rest should be enjoined for the time required to relieve the congestion. In this manner better results are obtained in the repair of lacerations.

Choice of Operation.—One of two steps is taken in the repair of lacerations: either the cervical tear is sutured (trachelorrhaphy), or the cervix is amputated. The choice depends upon the associated lesions. If the cervix is otherwise healthy, trachelorrhaphy is the operation of choice; but if the cervix is deeply infiltrated, if extensive erosions exist, if multiple cysts are incorporated in the cervix, if the cervix is elongated, amputation is the operation of choice.

FIG. 548



The sutures are tied.

Trachelorrhaphy. — Technic of Operation.—A general anesthetic is administered and the patient placed in the lithotomy position.

Step 1.—The cervix is exposed by a weighted vaginal speculum and two lateral retractors. The anterior lip of the cervix is grasped by a bullet forceps.

Step 2.—With long rat-tooth tissue forceps and a long curved scissors, the edges of the laceration are made raw by excising a strip of scar tissue the length of the tear and well down into the angle of the laceration, taking care to remove the plug of scar tissue in the angle. The utmost care must be exercised in the process of denudation for fear of removing the mucous membrane that is to form the cervical canal. For this purpose a strip one-fourth of an inch wide is left in the middle of either lip.

Step 3.—Sutures of No. 2 ten-day chromic catgut are now passed to unite the opposing denuded surfaces. The first suture is passed near the angle. A short cutting needle (Emmet's preferred) is passed from the outer margin of the line of denudation underneath the denuded surface and emerges at the margin of the strip of mucous membrane. The needle is then carried in an opposite direction through the opposite

lip of the cervix. The remaining sutures are passed at intervals of one-half inch until the external os is reached, when they are all tied.

To demonstrate the patency of the cervical canal a sound should be passed through the cervix. A gauze pack is now placed against the cervix and a sterile vulvar pad adjusted and held in place by a T-binder.

In incomplete lacerations a knife is passed into the cervical canal and the tissues severed in a way that will make the laceration complete. The operation is then performed as above.

After-treatment.—The patient should be directed to urinate in a bed-pan without the aid of a catheter, and the bowels should be opened at the end of forty-eight hours. A light diet is given and the patient kept in bed for one week.

AMPUTATION OF THE CERVIX

In prolapsus uteri associated with elongation of the cervix it is essential to shorten the cervix by amputation. This is done prior to the plastic operations upon the vaginal walls and pelvic floor, the successive steps being: (1) amputation of the cervix, possibly preceded by curettage; (2) anterior colporrhaphy; (3) posterior colpoperineorrhaphy.

One of two operations may be chosen: (1) either the flap amputation, in which a wedge-shaped portion is taken from the anterior and posterior lips of the cervix, or (2) a circular amputation. The latter is preferred for high amputation.

Technic of Operation.—1. **Flap Amputation** (Schroeder).—The patient is placed in the lithotomy position and the cervix exposed by a weighted speculum. The anterior lip of the cervix is grasped by tenaculum forceps and the sound introduced to measure the depth of the uterine canal to determine the extent of the amputation.

With sharp-pointed scissors the cervix is divided on either side to the point at which the amputation is desired. This forms an anterior and posterior lip.

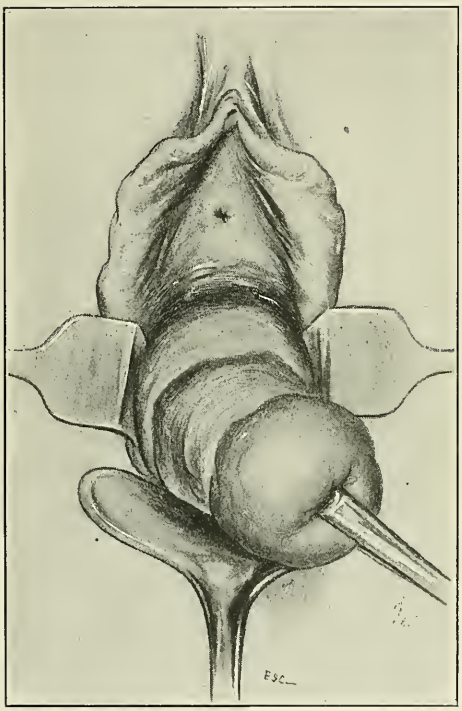
The assistant makes traction outward and upward upon the anterior lip, with the vulsellum forceps, while the operator grasps the posterior lip with long rat-tooth tissue forceps, and with a scalpel makes a deep transverse incision across the mucosal surface of the posterior lip about one-half inch below the upper limit of the lateral incision, the edge of the knife being directed inward and upward. Beginning upon the vaginal surface of the posterior lip, a second incision is made to extend upward and inward to meet the first incision, thereby removing the posterior lip and leaving a wedge-shaped incision. The raw surface is then closed by interrupted sutures of No. 2 ten-day chromic catgut.

A similar wedge is removed from the anterior lip and sutured, care being taken to preserve the cervical canal intact. The amputated lips are then brought together laterally by chromic sutures. An anti-

septic tampon of gauze is then inserted into the vagina and removed at the end of twenty-four hours, after which formalin vaginal douches, 1 to 2000, are given daily. After seven to ten days the patient is permitted to leave her bed, provided other conditions permit.

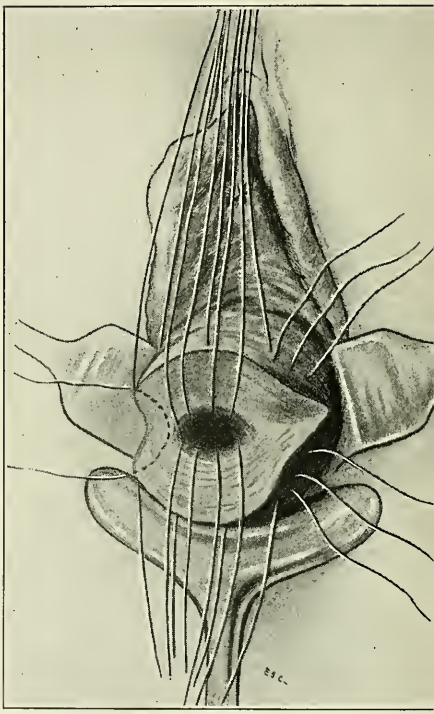
2. **Circular Amputation** (Martin).—Traction is made upon the cervix with vulsella. A circular incision is made through the vaginal mucosa of the cervix about 2 cm. above the external os. Two short lateral

Fig. 549



Amputation of the cervix. Vaginal mucosa reflected from the cervix to point of amputation. Cervix bisected into an anterior and posterior lip. Modified from Doederlein and Kroenig. Step 1.

Fig. 550



Amputation of the cervix. Anterior and posterior lips amputated, leaving a double wedge through which chromic catgut sutures are passed. Step 2.

incisions are made, one on either side, to facilitate the reflexion of the mucosa. The mucous membrane is then stripped upward, laying bare the cervix to the desired point of amputation. The cervix is then divided laterally, with a knife, into an anterior and posterior portion, the incisions being carried to the point of amputation.

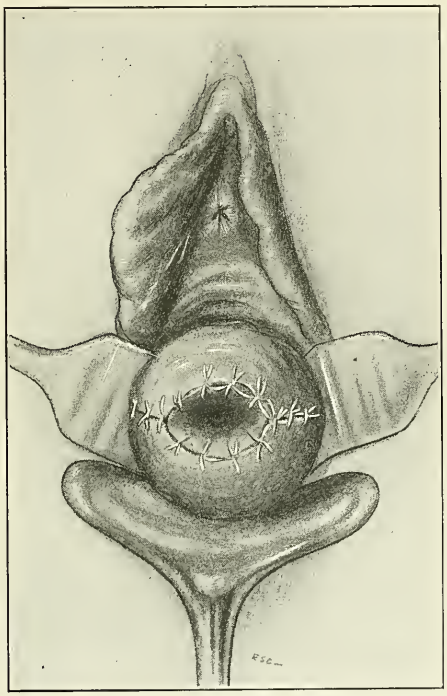
An oblique resection is then made of the anterior lip, the incision being carried from within outward and upward in such manner as to leave a thin flap on the mucosal side. The vaginal flap is turned over

the stump and its edges stitched with ten-day chromic catgut to the mucosa of the cervical canal.

The posterior lip is likewise resected and the posterior vaginal flap stitched to the mucosa of the cervical canal.

On either side of the cervical canal the anterior and posterior flaps are united by chromicized catgut.

Fig. 551



Amputation of the cervix. Sutures tied, taking care to preserve the cervical mucous membrane intact. Step 3.

The operator should be careful to preserve the patency of the cervical canal. Care should also be exercised to avoid opening into the peritoneal cavity and injuring the ureters.

The operative procedures above described, that is, amputation of the cervix, anterior colporrhaphy, and posterior colpoperineorrhaphy, will usually suffice for the correction of partial prolapse of the uterus.

PERFORATING WOUNDS OF THE UTERUS

A distinction is made between a penetrating wound of the uterus which does not involve the entire thickness of the uterine wall and a

perforating wound which passes through the entire wall of the uterus and into the pelvic cavity.

Frequency.—The author has found 172 case reports of perforating wounds of the uterus, but is inclined to believe that this is no index to the sum total of all cases, for it would seem that but a small proportion of cases are on record.

Dr. Paul Heineck, Chicago, reports two deaths and one recovery from perforating wounds of the uterus in 495 abortions and 2343 labors at term, which occurred in the Cook County Hospital of Chicago in the five years ending with 1907. Heineck has tabulated 160 case reports, which were all he could find in the literature up to 1907. A study of his tables will inspire caution, if not fear, in all who practise intra-uterine manipulations.

It is interesting to note that some of the early workers in pelvic surgery did not take this accident seriously. Tait writes that he never saw ill results from perforation of the uterus, and Lenoir found these cases of interest because of their frequency and innocuousness. It is the prevailing impression that curettage is an operation that requires but limited skill and experience, that the passing of a sound and the removal of placental tissue by the fingers, curet, or forceps is attended by little risk.

Causes of Perforation.—The uterus has been perforated by dilators, sounds, curets, fingers, douche-points, tents, and various articles employed for the purpose of inducing abortion. Not only has the uterus been perforated, but in numerous instances a loop of bowel has been drawn through the rent in the uterus, with fatal results.

Fatalities have followed upon curettements in which the uterus had been irrigated with bichloride, lysol, tincture of iodine, etc., following a perforation with the curet or forceps.

It is probable that the uterus is more often torn by the blades of dilators than by the curet or sound. In Hessert's case the uterus was torn by a dilator and the mesentery stripped from four feet of the intestines. The author has found 34 case reports in the literature in which the gut had been dragged through the wound in the uterus by the curet.

That the uterus may be perforated without the knowledge of the operator has been abundantly proved. Now and then one fears that he has perforated the uterus. Someone has referred to such cases as pseudoperforations. The conditions which may lead to such an impression are bicornuate or unicornuate uterus, a dilated uterine end of the Fallopian tube, through which the sound has been known to pass into the tube, an elongated and distorted uterine canal from the presence of tumor formations encroaching upon the cavity of the uterus, soft tumor and placental tissue into which the instrument sinks to an unexpected depth, and, finally, temporary paralysis of the uterus, which is occasionally developed in the course of a curettement.

Predisposing Factors.—In order to justify this accident in the hands of experienced and cautious operators, we have to consider the extreme

softness and thinness of the uterine wall under certain, not always recognizable, conditions. There is a physiological softening of the uterine wall during the menstrual period, throughout pregnancy, and the six and eight weeks of the puerperium. The septic uterus of gonorrheal, puerperal, or postabortive origin may be so soft as to offer slight resistance to the examining finger or instrument. The consistency of the uterine wall in such cases has been likened to "butter," to "goose fat," and to "wet brown paper." Less frequently we encounter degenerated uterine tumors, gangrene and abscess of the myometrium, and thinning of the wall through atrophic changes. Under the above conditions an operator may be ever so cautious and yet perforate the uterus. He may do so without his knowledge, and no harm ensue. It is not conceivable, however, that he will do irreparable damage to the abdominal viscera, or that he will fail to recognize his blunder and act with promptness and efficiency should the occasion arise.

Occasionally the perforating instrument has not been withdrawn. Trueb found a bougie in a retro-uterine abscess, also a catheter in the space of Retzius. In Ballard's case a crochet needle perforated the uterus, and finally passed through the abdominal wall without interrupting pregnancy. Talmey found a bougie in the cul-de-sac of Douglas. Johnson found a bougie in the folds of the omentum, and Fairchild a hairpin near the diaphragm. Marchand found a bougie between the two layers of the mesentery, removed two years later.

Preventive Measures.—We ask, *How can this accident be averted?* The author would formulate the following suggestions:

1. A careful consideration of the history, with special reference to an existing or recent pregnancy, and to infection of the uterus.
2. A preliminary bimanual examination, to note the position, size, form, and consistency of the uterus, and the possible existence of encroaching lesions, notably pelvic abscess.
3. The careful passage of the sound, when the bimanual examination has not clearly demonstrated the direction of the long axis of the uterus and the depth of the uterine cavity.
4. Extreme caution in dilating and exploring the cavity of the uterus.
5. Hegar bougies are preferred to instruments of divulsion. In dilating, "make haste slowly." Tents can be dispensed with.
6. In removing fetal tissue the fingers are preferred to any instrument.
7. Always bear in mind the extreme softness of the uterus in pregnant, puerperal, and infected cases.
8. When there is any suspicion of a perforation, do not irrigate.
9. Do not undertake to curet unless you are prepared to do an abdominal operation.

Treatment.—The treatment of perforation may be one of masterly inactivity or of immediate surgical intervention. A comparatively minor operative procedure may lead to one of most serious import, and require the exercise of the highest order of skill and experience in abdominal surgery. We may fairly say, therefore, that one should

not deliberately assume the responsibility of a currettement unless he is prepared to meet any emergency that may arise.

When the operation is done in a cleanly manner and the field of operation is free of infection, a perforation of the uterus will seldom prove serious. Under such conditions, and when the operator is confident that he has done no injury to the abdominal viscera, he should go no farther with his operation, but should pack the uterus lightly with antiseptic gauze, place the patient in bed, put an ice-bag over the hypogastrium, and administer ergot.

If there is a suspicion of injury done to the bowel, of hemorrhage into the peritoneal cavity, or of septic material having been conveyed to the peritoneum, no time should be lost in opening the abdominal cavity and in repairing the injury done. If the rent in the uterus can be sutured this should be done, but the softness and friability of the uterus will occasionally prevent a successful closure. Hysterectomy is then the only alternative. Under no circumstances should the uterine cavity be irrigated after a puncture. As a rule no attempt should be made to suture a perforated wound in an infected uterus; the uterus should be removed and drainage established.

Injury to the bowel has usually consisted in the stripping off of the mesentery. When this is done the bowel is thus deprived of its blood supply and must be resected. Punctures of the bowel should be sutured. Vaginal hysterectomy has been done in a number of instances of perforation of the uterus. This operation is open to the objections that possible injuries to the bowel may be overlooked, and that the uterus may be unnecessarily sacrificed—one that could have been safely left to drainage and to suture of the wound.

The expectant plan of treatment has been pursued in 66 reported cases with 21 fatalities. Abdominal section with the necessary repairs have been done in 72 reported cases, with 52 recoveries, 17 deaths, and 3 not recorded; vaginal hysterectomy 15 times, with 10 recoveries, 4 deaths, and 1 not recorded. Out of a total of 154 reported cases there have been 108 recoveries, 42 deaths, and 4 not recorded (Heineck).

CHAPTER XXXI

FECAL AND GENITO-URINARY FISTULÆ

Fecal Fistulæ
- Rectovaginal Fistula
- Rectoperineal Fistula
- Rectolabial Fistula
- Enterovaginal Fistula

Genito-urinary Fistulæ
- Urethral Fistula
- Vesical Fistulæ
- Vesicovaginal Fistula
- Vesico-uterine Fistula
- Vesicocervical Fistula

Ureteral Fistulæ
- Ureteral Fistula at Vault of Vagina
- Ureterocystostomy
- Nephro-ureterectomy

FECAL FISTULÆ

Rectovaginal Fistula.—**Causes.**—An abnormal communication may be formed between the rectum and vagina by the following causes:

1. Cancer invading the rectovaginal septum.
2. Incomplete healing of a complete tear of the perineum.
3. Accidental injury in performing perineorrhaphy.
4. Tuberculous and syphilitic ulcerations of the vagina and rectum.
5. Rupture of perirectal and pelvic abscesses through the rectovaginal septum.
6. Ill-fitting and neglected pessary.
7. Direct violence.

Symptoms.—The condition is very distressing. The patient has no control over the gas, and this alone impels her to shun society. Unless the fistula is large, solid feces will not pass through the opening, but a small fistula permits of the escape of liquid feces. The escape of the feces into the vagina gives rise to an irritation of the vaginal walls and vulva, which adds greatly to the patient's discomfort.

Diagnosis.—The patient complains of inability to control the gas and bowel movements. She is annoyed by the presence of feces in the vagina and by the irritation of the vulvar and vaginal surfaces.

Inspection.—The patient is placed in the lithotomy position and the anterior wall of the vagina elevated by a Simon retractor. Large and moderate-sized openings are readily detected, but small ones may escape detection without the aid of a probe or the injection of colored fluid, such as milk, into the rectum. By the aid of the probe the opening may be located, first passing the index finger into the rectum and searching for the opening with a small probe (Fig. 552).

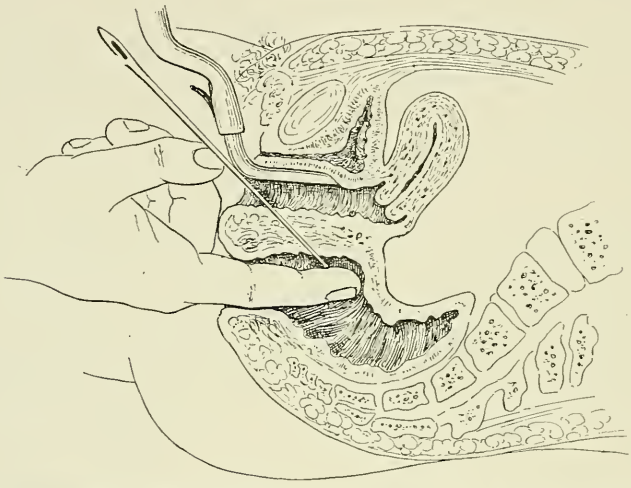
Prognosis.—Even large fistulæ are known to heal spontaneously, unless due to cancer and possibly syphilis and tuberculosis. In operating a rectovaginal fistula of whatever size one must bear in mind the

uncertainty of getting a good result. The stitches are very liable to become infected, and the gas tension within the bowel subjects the stitches to undue strain.

Treatment.—Tentative and Palliative.—*In cancerous cases* no effort should be made to repair the injury. All that can be done for such cases is to keep the parts clean and in every way to add to the comfort of the patient.

Syphilitic fistulæ should not be operated until a long course of antisyphilitic treatment is completed.

Fig. 552



Rectovaginal fistula. Sound passed through the vagina into the rectum and palpated through the rectum.

Traumatic fistulæ tend to heal spontaneously if properly handled. At all events much can be done to reduce the size of the opening before resorting to operative procedures. The patient should be kept at rest for the first two or three weeks, when she may be allowed to take moderate exercise.

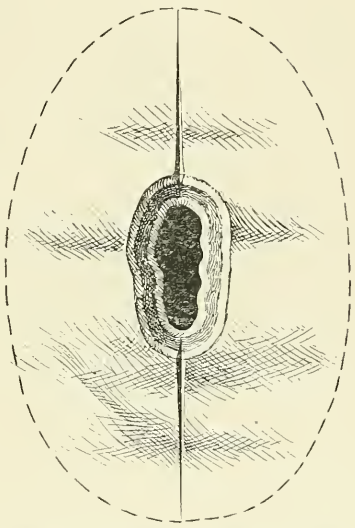
Vaginal douches of formalin, 1 to 2000, creolin or lysol, 1 to 300, should be given three or four times daily. Care should be taken to avoid further injury by the douche-point. The bowels should be kept open by mild cathartics, reinforced by soap and water enemata. As the sinus grows smaller its margins should be stimulated by lunar caustic, to be applied once or twice a week.

Chronic Cases.—Preparatory Treatment.—The bowels are to be thoroughly emptied. The author's preference is for castor oil, given twenty-four hours before the operation, and followed in six hours by a soap-and-water enema, given in the knee-chest position. The diet for two days before the operation should be liquid. Before proceeding with the operation the sphincter should be paralyzed by

overstretching and a gauze tampon placed in the rectum above the fistula to protect the field of operation from the contents of the bowel. The tampon is removed at the completion of the operation.

Technic.—Here the flap-splitting operation of Lauenstein is recommended. The fistula is exposed by a hanging speculum and two lateral retractors. The margin of the fistula is pared with a knife or scissors. This renders the vaginal and rectal walls raw, with the least possible loss of tissue. A vertical incision one-half inch in length is carried through the vaginal wall at a midpoint above and below the fistula. An elliptical incision is next made through the vaginal wall connecting the distal ends of the vertical incisions on either side and the flap of vaginal wall is removed. Interrupted No. 2 chromic catgut sutures are passed from side to side through the wall of the rectum, not including the mucosa; these are tied. Next the vaginal walls are approximated with silkworm gut. A loose pack of iodoform gauze is placed in the vagina and the operation is completed.

Fig. 553



Incision in Lauenstein's operation for recto-vaginal fistula.

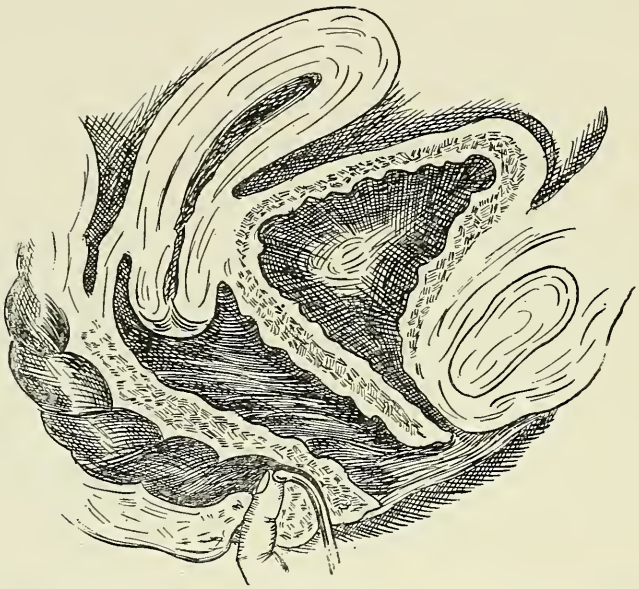
After-treatment. — The bowels should not be opened before the morning of the fourth day, or later, if the condition of the patient will permit. The author has kept the bowels locked for eight days, and again gas pains and distention have necessitated their being opened on the third day. A liquid diet should be given so long as the bowels are locked. The gauze pack is removed from the vagina at the end of forty-eight hours and daily vaginal douches given. The stitches should be removed on the tenth day unless infected, in which case they should be removed earlier.

The author has been more successful in the closure of rectovaginal fistulæ since adopting the method of splitting the rectovaginal septum below the fistulous opening before attempting the closure.

With a grooved director as a guide passed through the fistulous opening between the vagina and rectum, the tissues are severed with a knife. In this manner a complete division of the pelvic floor in advance of the fistula is effected. After freshening the margins of the fistula by cutting away a narrow strip, interrupted sutures of No. 2 ten-day chromic catgut are placed in the rectal wall at intervals of one-quarter of an inch and interrupted sutures of linen or silk are placed in the vaginal wall. Great care should be taken in coapting the sphincter ani muscles. For this purpose the author uses interrupted linen sutures.

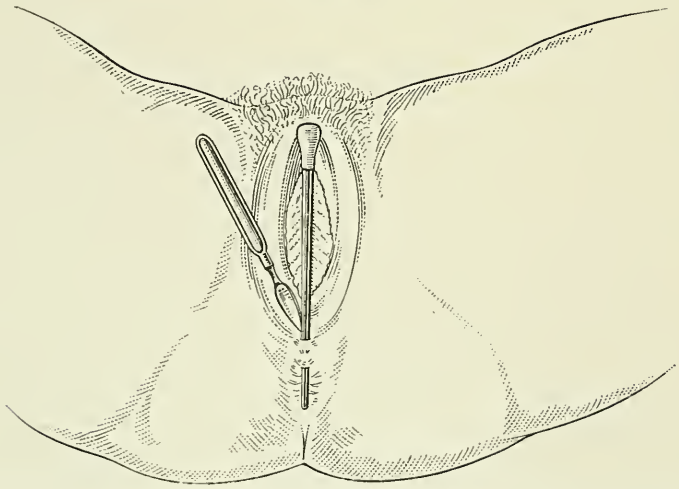
Rectoperineal Fistula.—A fistula may connect the rectum with any point on the surface of the perineum. The first step in the operation for repair is to pass a grooved director through the fistula and sever

FIG. 554



Rectoperineal fistula. Sound passed through the vagina; the fistula is palpated by the finger inserted into the rectum.

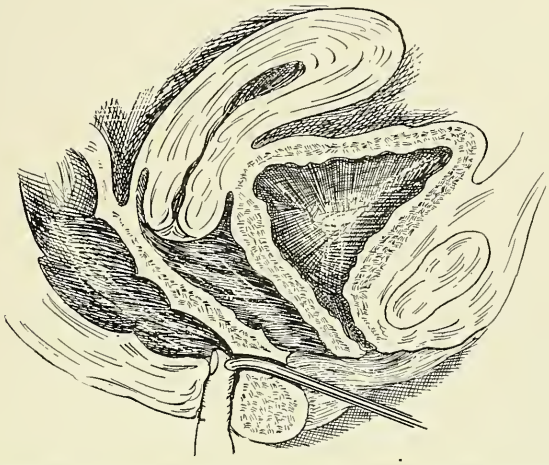
FIG. 555



Rectoperineal fistula. Grooved director passed through the fistula. Fistulous tract is laid bare by passing the knife along the groove of the director.

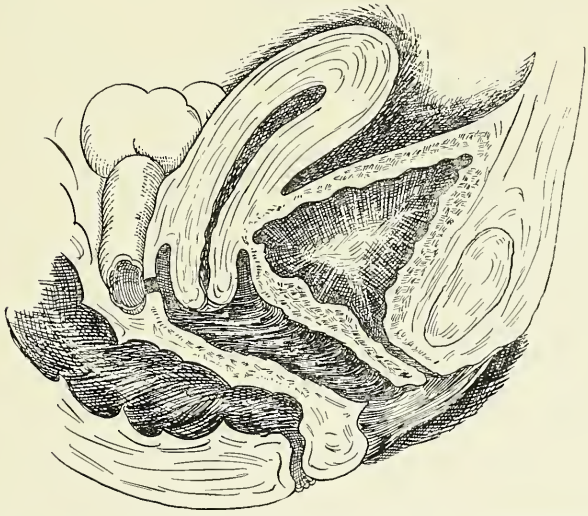
the tissues which include the sphincter muscle and more or less of the perineal body. Sutures are then passed as in the immediate repair of a completely lacerated perineum.

Fig. 556



Rectolabial fistula. Sound passed through fistula is palpated by finger in the rectum.

Fig. 557



Enterovaginal fistula. Loop of small bowel communicates with the vagina through the posterior fornix of the vagina.

Rectolabial Fistula.—The fistulous tract leads from the rectum to a point in the labia majora, and is usually the result of a rectal abscess burrowing into the labia.

Treatment.—Either an elastic ligature or a grooved director is passed through the fistula and the intervening structures severed. The wound is left to heal by granulation.

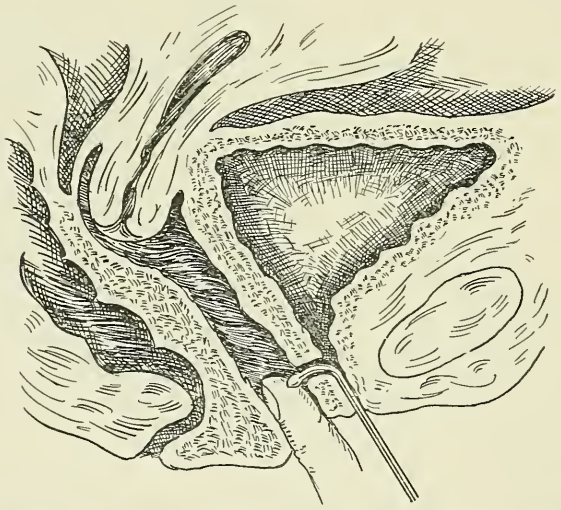
Enterovaginal Fistula.—A communication between the small bowel and the vagina is the result of deep lacerations in labor and of accidental perforation of the bowel in vaginal celiotomy. In lacerations involving the lower uterine segment and peritoneum a loop of bowel may become engaged in the wound and the resulting sloughing cause a fecal fistula.

Treatment.—The treatment consists in resection of the bowel through an abdominal incision. Following the resection of the bowel a side-to-side anastomosis should be made.

GENITO-URINARY FISTULÆ

Urethral Fistula.—It is unusual for a fistula of the urethra to be formed from any cause. As a result of labor it is commonly associated with a vesicovaginal fistula. These fistulæ usually involve the lower wall and communicate with the vagina. They are, as a rule, located near the bladder, and when so located they may be the cause of involuntary loss of urine. When, however, they are small and located farther forward, no incontinence of urine may be occasioned, and hence their presence does not require operative interference.

FIG. 558



Urethrovaginal fistula A sound passed into the urethra is palpated by the finger in the vagina, the sound passing through the urethral fistula.

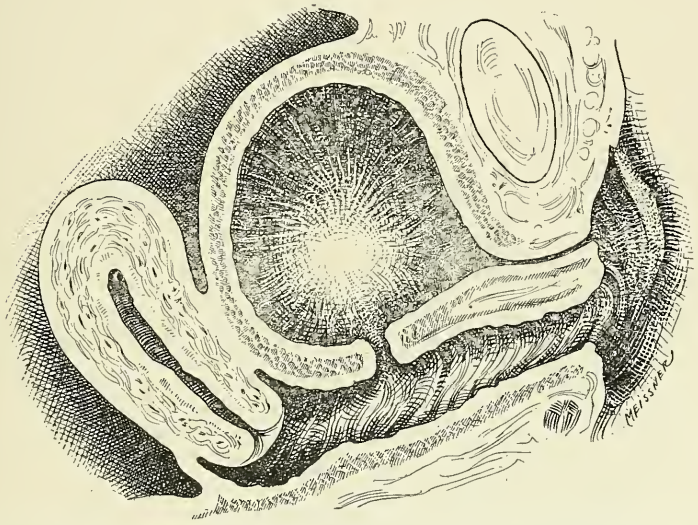
Treatment.—A simple fistula is closed by denuding its margins and shaping the opening like a funnel, with the base to the vaginal

surface. Fine linen or silk sutures are passed interruptedly, carefully coapting the margins. A self-retaining catheter should be worn four to six days.

Vesical Fistulæ.—By means of a fistula a communication is established between the bladder and the vagina, uterus, or intestine. The following varieties of vesical fistulæ are known:

1. Vesicovaginal.
2. Vesico-uterine.
3. Vesicocervical.
4. Enterovesical.

Fig. 559



Vesicovaginal fistula. A communication is established between the base of the bladder and the vagina at a midpoint in the anterior wall of the vagina.

1. **Vesicovaginal Fistula.**—Vesicovaginal fistula is most often the result of traumatism during labor. Protracted parturition, in which the head presses firmly upon the vesicovaginal septum, destroys the vitality of the tissues and leads to sloughing, with the formation of a permanent fistulous communication between the vagina and bladder. The author has, at the present writing, a case under observation in which the vesicovaginal fistula was caused by obstetric forceps during the attempted delivery. It is seldom, however, that fistula are caused by direct violence in the use of forceps. More often it is due to the long delay in the application of the forceps.

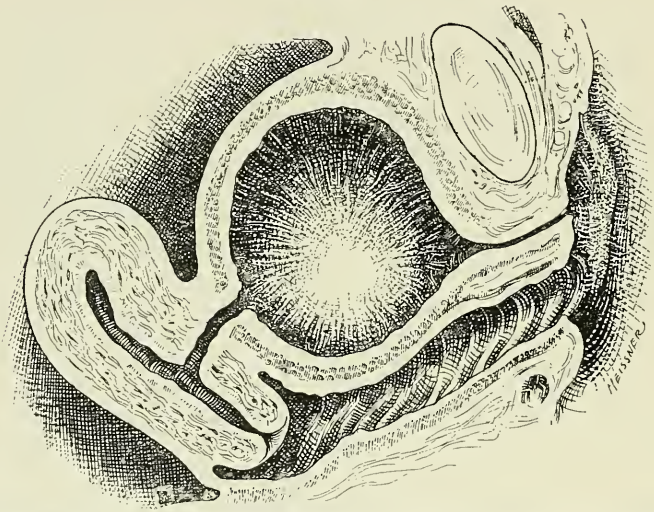
Carcinomatous invasion of the vesicovaginal septum is second in point of frequency. Other causes are vesical calculi, injuries sustained in vaginal operations, and ulceration from the pressure of an ill-fitting pessary. Forced catheterization during labor may perforate the bladder. Finally, pelvic abscesses may perforate both into the bladder and vagina, thereby forming a vesicovaginal fistula.

The *diagnosis* of vesicovaginal fistula is made by the history of a possible cause, the complaint of incontinence of urine with its disagreeable consequences, and, finally, by direct inspection.

It is unusual for a fistula developing after labor to manifest itself before the end of the first week, though it is possible for urine to escape through the vesicovaginal septum during labor.

The symptoms are quite characteristic. Before the urine escapes through a fistula there are usually symptoms of cystitis, bloody urine, and rise of temperature. A foul-smelling vaginal discharge indicates the sloughing of the vaginal wall, and this is soon followed by a dribbling of urine into the vagina. The vagina, vulva, perineum, and inner aspects of the thighs soon show the irritating effect of the urine in the

FIG. 560



Vesico-uterine fistula. A communication is established between the fundus of the bladder and the uterus at about the level of the internal os.

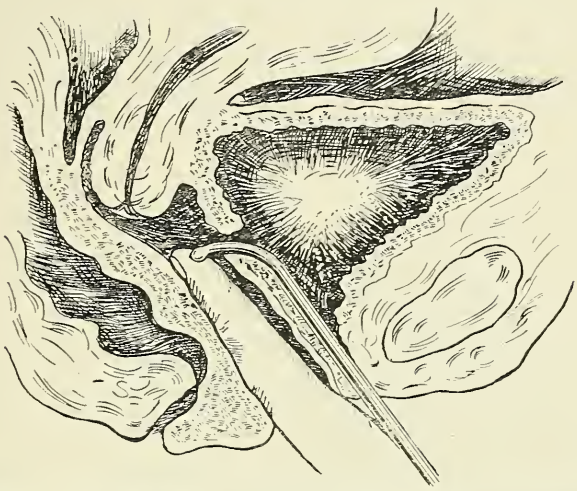
form of vulvovaginitis and local dermatitis. The distress and inconvenience of the dribbling lowers the vitality of the patient, and she may become extremely weak and emaciated. Such individuals are almost invariably sterile. Menstruation may be absent, irregular, or painful, but may also be perfectly normal. When the fistula is high up and small, the disturbance may be slight and the general health unimpaired.

Difficulty in voiding urine following labor should always suggest the possible development of a urinary fistula. Under such circumstances it is well to avoid vigorous manipulation for fear of creating or extending a fistula in tissues already devitalized.

Palpation of the fistula seldom affords satisfactory information when the tissues about the fistula are soft and necrotic. This is par-

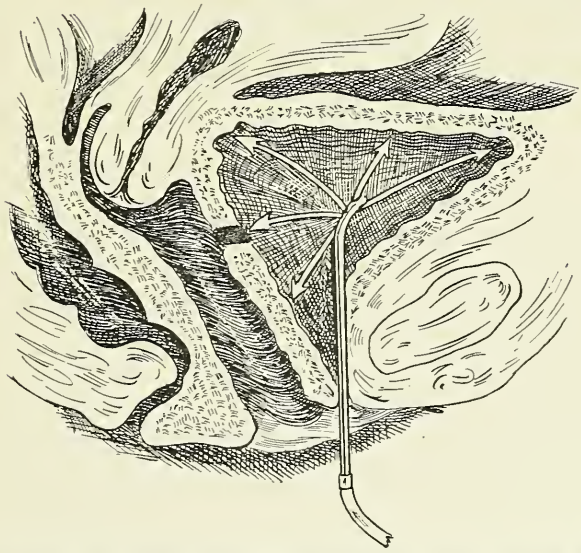
ticularly true of a small opening. In long-standing cases the puckered scar tissue and an opening possibly filled with soft mucous membranes may often be recognized.

Fig. 561



Vesicovaginal fistula. A sound passed by way of the urethra into the fistulous opening and palpated by the finger in the rectum.

Fig. 562



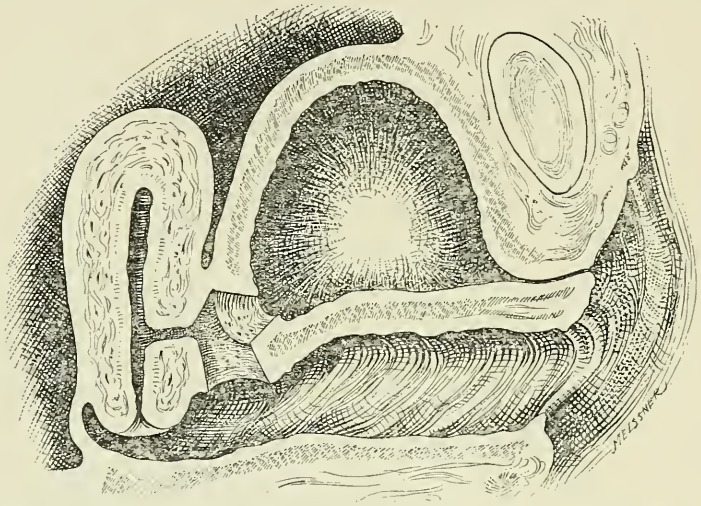
Vesicovaginal fistula. The bladder irrigated with sterile water colored with methylene blue. The blue solution will be seen to pass through the fistulous opening into the vagina. (After Ashton.)

A sound placed in the bladder and the index finger of the opposite hand in the vagina may be brought together through a fistulous opening.

Inspection will give positive information as to the location and size of the fistula. A Sims speculum introduced into the vagina will expose the fistula if the opening is large enough. Sterilized milk or some colored sterile fluid injected into the bladder may be seen to flow through the fistula. The cystoscope will expose the opening from the vesical side and at the same time afford information respecting the condition of the bladder—whether cystitis exists and foreign bodies lie within.

Having established the diagnosis of vesicovaginal fistula, it becomes important to consider the nature of its borders, their fixation, tension, and the possible existence of other fistulæ.

FIG. 563



Cervico-vesicovaginal fistula. A communication is established between the cervical canal, vagina and bladder

2. **Vesico-uterine Fistula.**—When a laceration of the cervix extends into the lower uterine segment and the adherent bladder, it is possible for healing to be complete in the lower portion of the wound, leaving a fistulous opening above between the uterus and bladder.

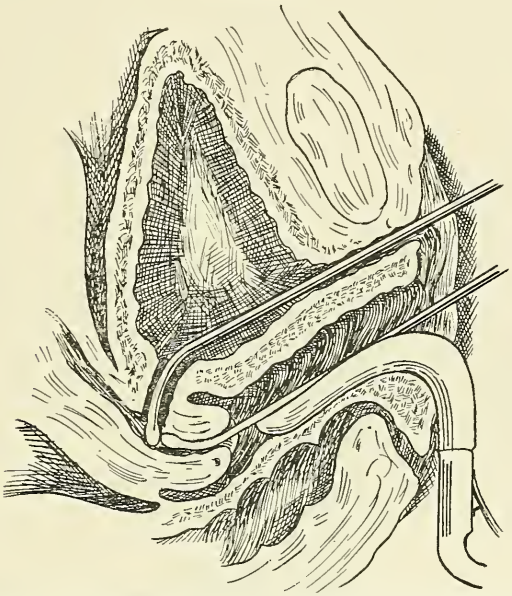
The urine may be discharged in part through the cervix and in part through the urethra, depending upon the size of the fistulous opening and the position of the patient. To demonstrate a communication of the bladder with the uterus, inject sterile milk or sterile colored fluid into the bladder and observe through a speculum that the fluid escapes from the cervix. To demonstrate that it is not a uretero-uterine fistula, observe that the flow of urine from the cervix is not intermittent. Catheterizing the ureters will demonstrate them to be intact.

3. **Vesicocervical Fistula.**—Likewise in extensive lacerations of the cervix involving the supravaginal portion and the base of the bladder, a fistulous communication between the cervical canal and the bladder

may be formed and persist. Such fistulæ are demonstrated in a manner similar to that indicated in vesico-uterine fistula.

4. **Enterovesical Fistula.**—It is extremely rare that a fistulous communication develops between the bowel and bladder. The condition may arise through ulceration of the bowel and as the result of injury.

Fig. 564



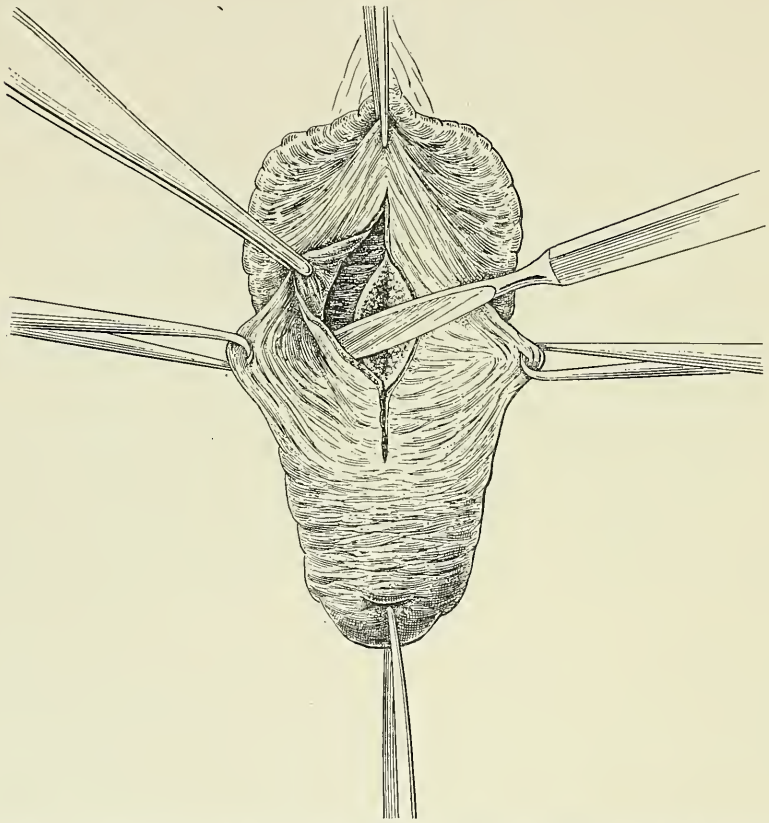
Vesicocervical fistula. A sound within the cervix and another sound within the bladder are approximated through the fistulous opening between the bladder and cervix.

Treatment.—The management of vesical fistulæ, at the time of their development, depends largely upon the causal factors. If the fistula is the result of direct injury in the course of an operation, such as may happen in the performance of pelvic operations, repair by direct suturing should be effected at the earliest moment. But when the fistula is the result of continued pressure, as in childbirth or vesical calculi, or when due to ulcerative processes, no attempt should be made to close the opening until the tissues are placed in a healthy state. This may require a long period of preparatory treatment. In small fistulous openings a spontaneous cure may be effected. I have seen a vesico-vaginal fistula the size of a five-cent piece close spontaneously.

Preparatory Treatment.—When the fistulæ are the result of pressure necrosis, and in all cases in which the margins of the fistula are in an unhealthy state, the patient should be kept in bed and frequent mild antiseptic vaginal douches should be given. All sloughing tissue should be removed with scissors or curet, and all unhealthy granulations and incrustations of salt should be removed by the swab, curet or cautery. A small fistulous opening may be stimulated to heal

by the occasional application of lunar caustic or the Paquelin cautery. These applications should not be made oftener than one week apart, and should be substituted by the radical operation for closure of the fistulous opening when the tissues are in a healthy state and the stimulating effects of the applications do not require a satisfactory closure. In long-standing fistulæ it is not probable that cauterization will effect a cure.

FIG. 565

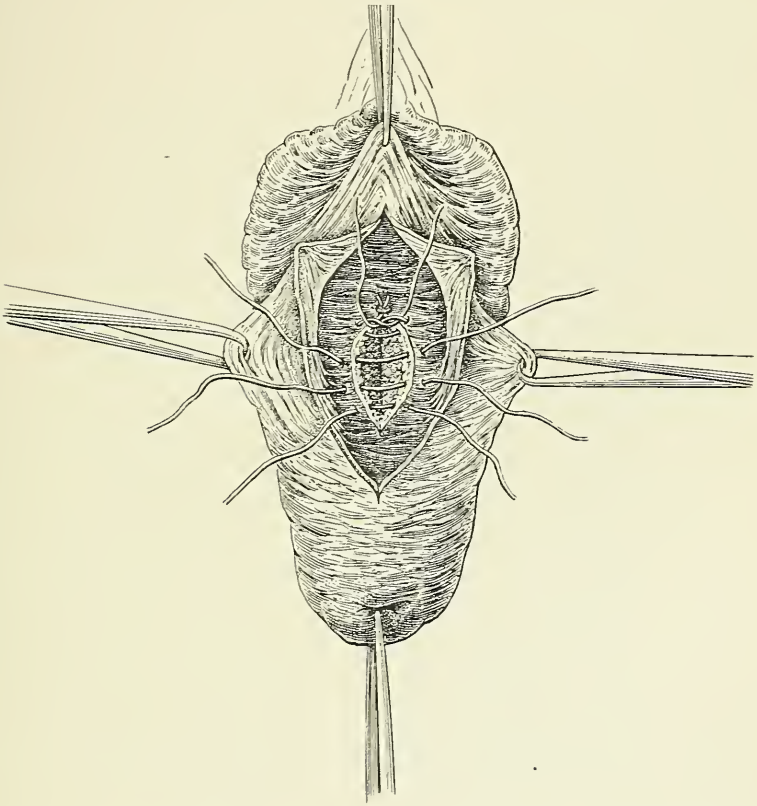


Repair of a vesicovaginal fistula. A vertical incision through the vaginal mucosa is made above and below the opening and the vaginal wall reflected from the bladder one-half inch from the margin of the fistula. Step 1.

RADICAL OPERATION.—When a fistulous tract is in a favorable condition for repair it is not advisable to persist in tentative measures. The most satisfactory course to pursue is through surgical measures. Too long delay may lead to embarrassments from cicatricial contractures of the vagina. When such contractures exist to a degree that renders access to the fistula difficult, space may be gained by making deep lateral incisions on either side of the rectum. After closing the fistula these lateral incisions may be sutured with chromic catgut. When the

margins of the fistula are fixed and distorted from the presence of scar tissue, it may be difficult to approximate the margins of the opening and the atrophic condition of the tissues renders healing slow and uncertain; hence the advisability of operating as early as the wound can be made ready. In postpartum cases the favorable time is about the sixth to the tenth week of the puerperium.

Fig. 566



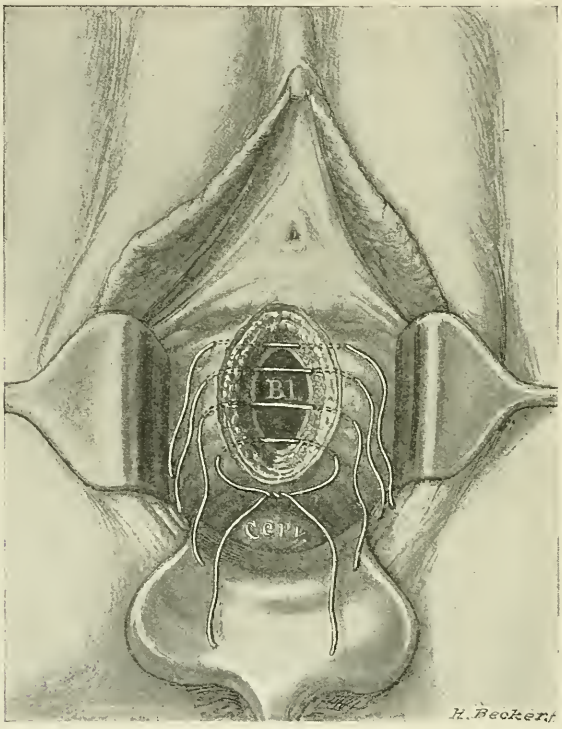
Repair of a vesicovaginal fistula. No. 2 ten-day chromic catgut sutures are passed through the bladder wall, not including the mucosa; these are tied and the vaginal wall is sutured with linen or silkworm gut. Step 2.

When the margins of the fistula can be approximated by the aid of tenacula without undue tension, the method of Sims, Simon, or Jobert will be effective. This consists in denuding the margins of the fistula with as little loss of tissue as possible and closing the opening by sutures. It will bear repetition that in the repair of all fistulæ there must be the least possible loss of tissue. No attempt should be made at closure until it is first demonstrated by the aid of tenacula that the margins of the opening can be approximated without undue tension. The following steps are to be observed:

1. *Position of the Patient.*—Whatever position will best expose the fistula should be adopted. Sims recommended the left lateral position, Simon the elevation of the hips, but the majority of operators prefer the lithotomy position.

2. *Exposure of the Field of Operation.*—In the left lateral position, Sims' speculum should be used. In the lithotomy position the weighted speculum is used to retract the posterior vaginal wall, and to further expose the fistula, lateral retractors are employed.

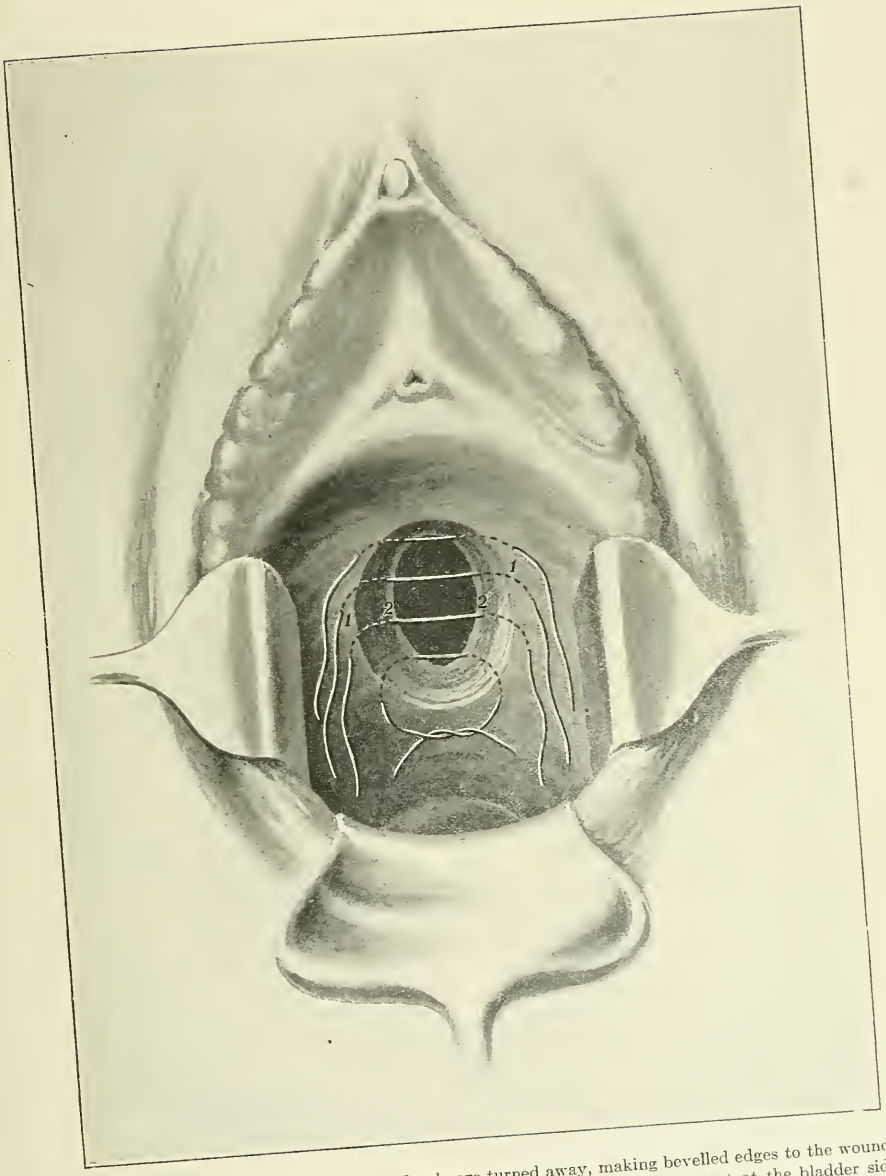
Fig. 567



Classical operation, sutures inserted transversely instead of vertically. (Kelly.)

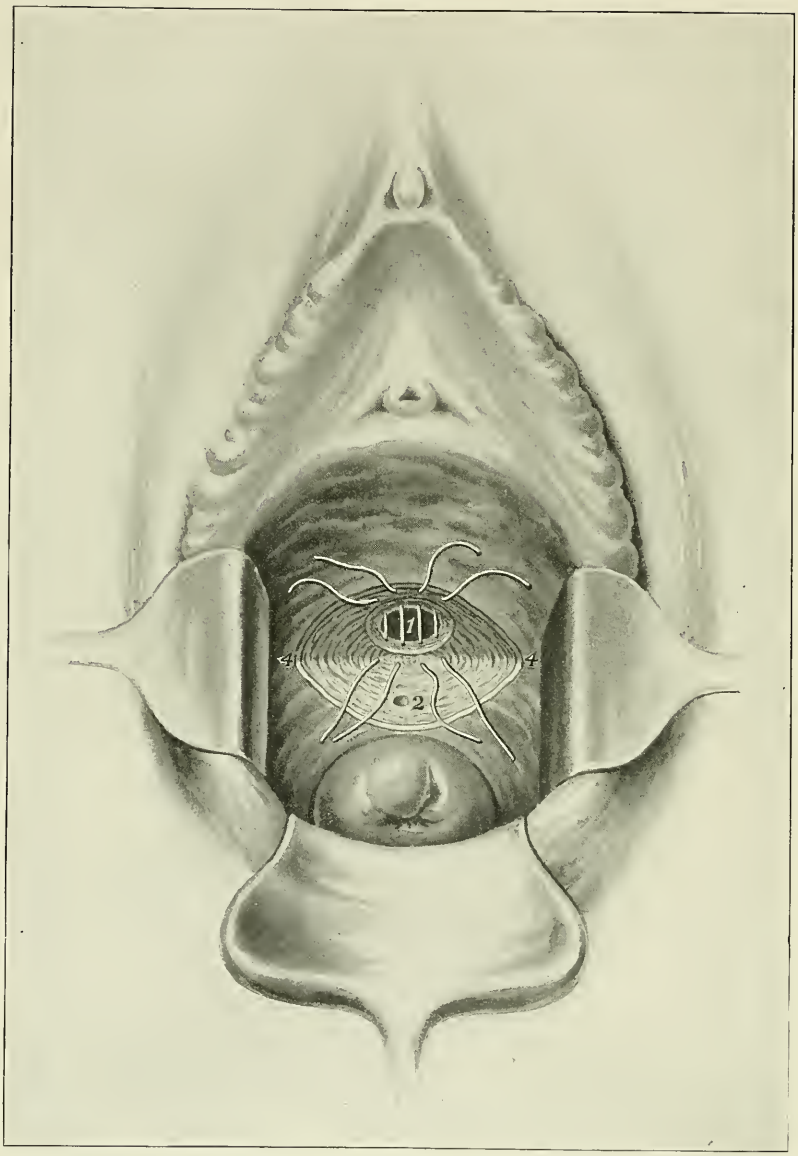
3. *Denuding the Margins of the Fistula.*—The method the author usually employs differs somewhat from that of Sims or Simon. He makes a median vertical incision at the upper and lower extremities of the fistula. This incision is about one-half inch in length, and extends only through the vaginal mucosa and not into the bladder wall. He then proceeds to rim about the margins of the fistulous opening, thereby reflecting the vaginal mucosa from the bladder around the entire circumference of the opening, making a flap about one-half inch wide. The opening can then be closed without any loss of tissue, and in this respect the method has the advantage over all others.

Fig. 568



Sims' operation. The margins of the fistula are turned away, making bevelled edges to the wound, giving it a funnel-shaped appearance, widest on vaginal surface 1–1, narrowest at the bladder side 2–2. Wire sutures are introduced well back on the vaginal surface and emerge from the raw surface just beneath the vesical mucosa (2–2), then cross over the opening and return in the reverse direction Sutures placed transversely to the long axis of the vagina. (Illustration after Kelly.)

Fig. 569



Follet's operation. 1, bladder opening after introduction of sutures; 2, uterine opening; 4, extremities of vaginal incision.

4. *Suture of the Fistulous Opening.*—Two layers of sutures are required. The first is of No. 2 ten-day chromicized catgut; these sutures are interrupted and pass through the bladder wall, not including the mucosa. The second layer of sutures is of silk, linen, or silkworm gut, and is passed interruptedly through the vaginal mucosa.

In passing the sutures the direction of least resistance must be observed so that when the wound is closed the line of suture may assume the shape of one of the following characters: V, —, ~, S, 2, \, /, U.

Accurate approximation of the margins is insisted upon. This will avoid hemorrhage into the bladder, and will best insure closure. When the fistula is located near the ureteral openings, care must be taken to avoid passing the sutures through the openings. A good safeguard is to pass a ureteral catheter into either ureter to serve as a guide.

After-treatment.—The patient should remain in bed one week to ten days. A self-retaining catheter should be worn for about five days. Vaginal douches of formalin, 1 to 4000, or lysol or creolin, 0.05 per cent., are given twice daily. The bowels and diet are to be carefully regulated. The non-absorbable stitches are to be removed on the twelfth day.

Of late years a variety of operations have been devised for the closure of large fistulæ which cannot be closed by direct suture as described above, not only because of their size but because of the presence of scar tissue. These operations are largely based upon the principle of closing the opening in the bladder, which is a flexible structure. This is possible when the bladder is separated from the vaginal wall.

Mackenrodt's Operation.—Mackenrodt devised an operation which is generally satisfactory. The following are the steps of the operation:

Step 1.—The patient is placed in Sims' position and the fistula exposed by means of a Sims retractor. Tenaculum forceps are made to grasp the cervix and other forceps the urethral prominence. Traction is made upon these forceps to put the intervening tissues on the stretch.

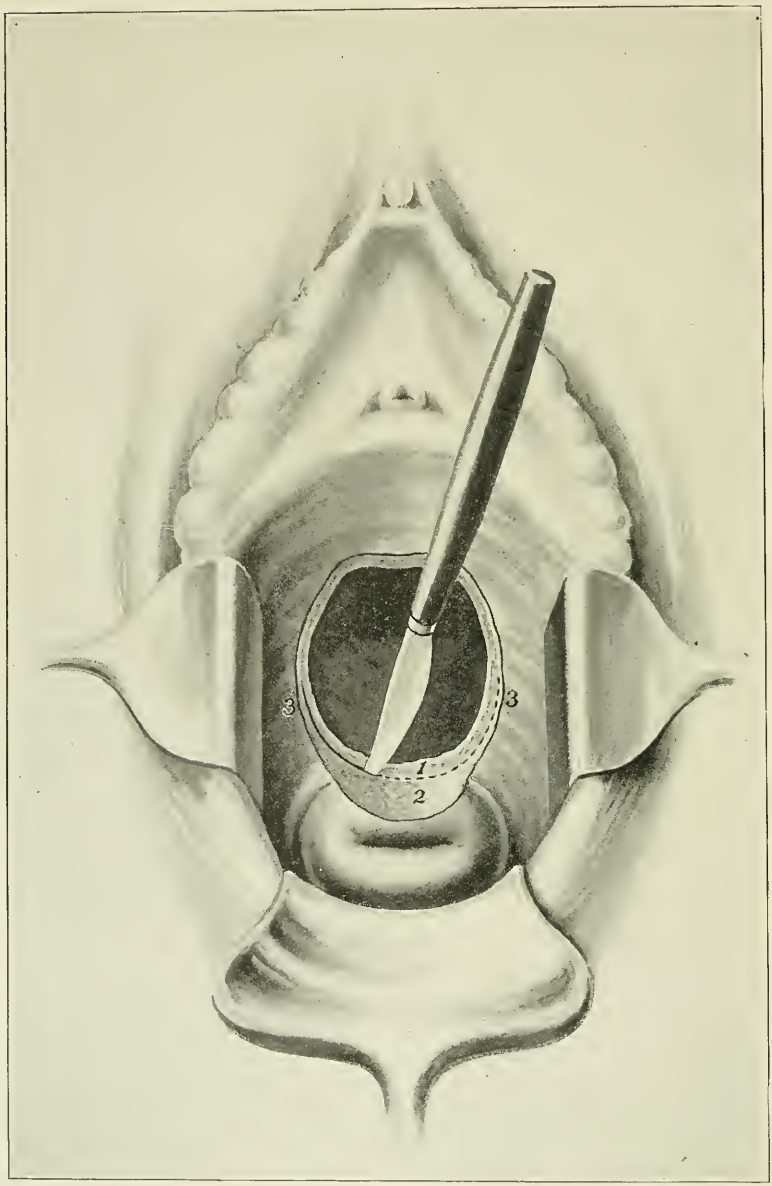
Step 2.—A half-inch incision is made through the vaginal wall immediately above and below the fistulous opening.

Step 3.—The vaginal wall is separated from the bladder wall on all sides of the fistula. This dissection should be sufficiently wide to permit of easy coaptation of the margins of the fistula in the bladder.

Step 4.—The margins of the fistula are denuded and then sutured with fine linen. Two or three rows of interrupted sutures may be inserted.

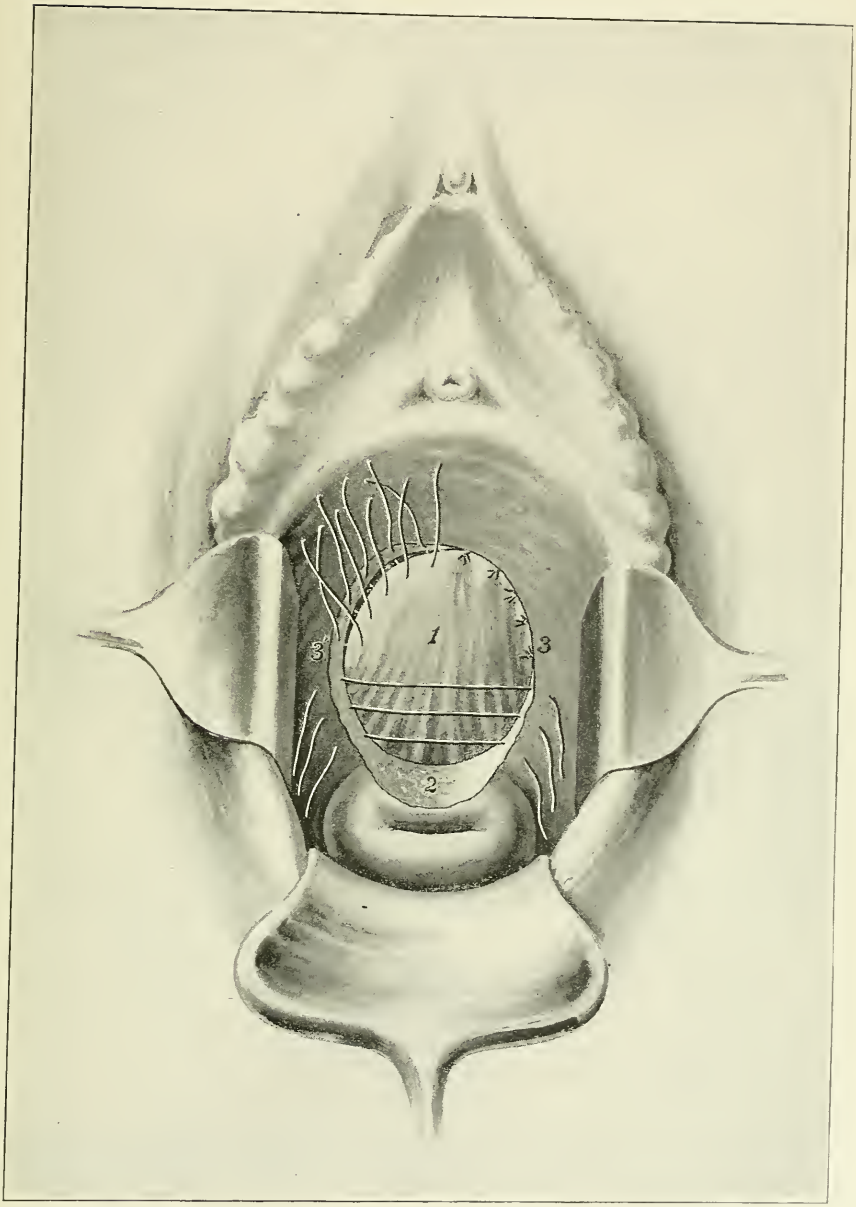
Step 5.—The free margins of the vaginal incision are freshened and coapted with silkworm-gut sutures as far as possible. Before closing the vaginal opening, the uterus is brought forward between the bladder and vaginal walls. Sutures are passed through the vaginal walls and uterus. This serves the double purpose of closing the vaginal opening and holding the uterus in anteflexion. When the vaginal walls cannot be coapted the uterus will serve to fill up the gap.

Fig. 570



Mackenrodt's operation. The bladder (1) is dissected from the uterus (2) and the vaginal walls dissected (3–3′) until its edges meet without tension. (After Kelly.)

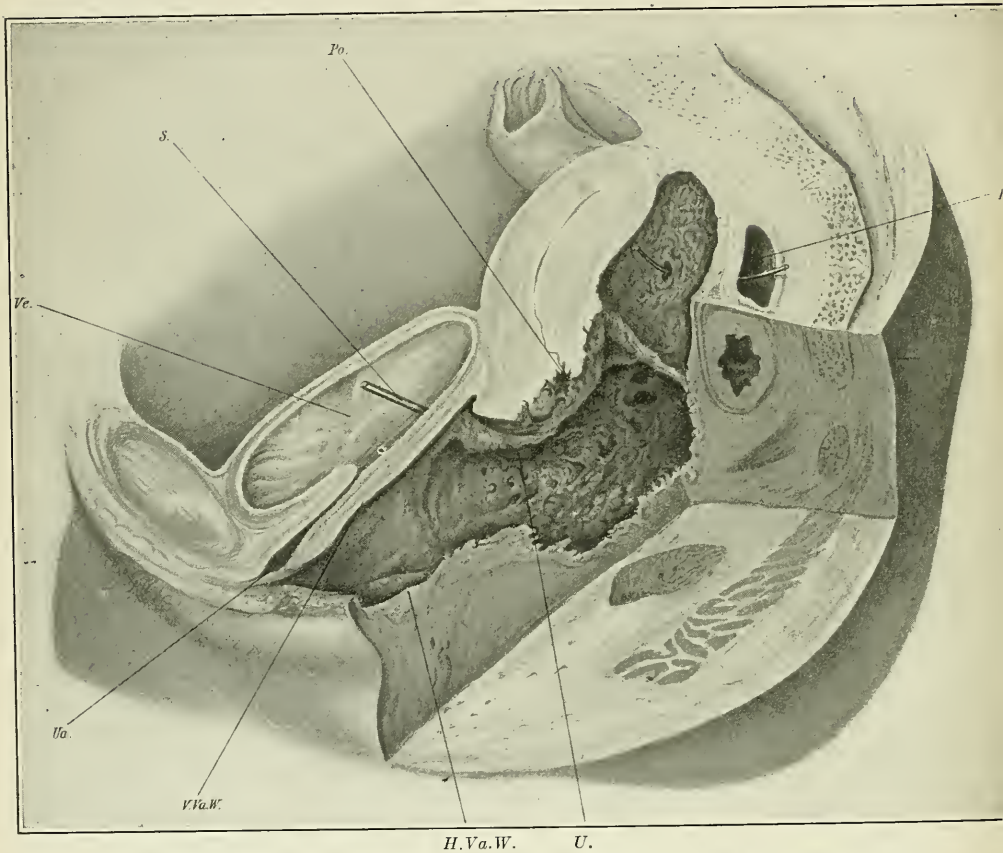
FIG. 571



Mackenrodt's operation. The bladder is closed more or less transversely, drawing the part (1) which has been separated from the uterus forward, thus making a U-shaped line of sutures. The latter should be catgut and passed through the edges of the bladder without penetrating its mucous membrane. The vaginal wall (3–3′) is then closed with silkworm gut passed from side to side without entering any part of the bladder wall. The catgut stitches in the bladder are completely buried. In a large fistula Kelly modified this operation by leaving the vaginal walls to close by granulation. (After Kelly.)

Treatment of a Vesico-uterine Fistula.—A small fistula which establishes a communication between the bladder and uterus, or between the bladder, uterus, and vagina, may heal spontaneously; but such a happy result cannot be relied upon. In operating such a case, Champney passed a probe through the fistula, bringing it out of the cervix. He then made a transverse incision $3\frac{1}{2}$ cm. long through the anterior fornix

FIG. 572



Ureterovaginal fistula from cancer of the cervix uteri. *H.Va.W.*, posterior vaginal wall; *Po.*, portio vaginalis attacked by cancer; *R.*, rectum; *S.*, sound in the ureter; *U.*, ureter; *Ua.*, urethra; *Ve.*, bladder; *V.Va.W.*, anterior vaginal wall. (Tandler and Halban.)

of the vagina. The bladder was stripped from the cervix by means of scissors and fingers to a point well above the fistula. In this manner the opening into the cervix and another into the bladder were freely exposed to view.

The opening into the bladder was closed with several fine silver-wire sutures passed from side to side. The opening into the cervix was

closed in a similar manner. The vaginal wall was then sutured to the cervix, using silkworm gut. A self-retaining catheter was left in the bladder.

Ureteral Fistulæ.—An abnormal opening into the ureter may establish a communication between the ureter and the abdominal wall, vagina, bowel, or peritoneal cavity, and so direct all or a part of the urine from its natural course.

Congenital fistulæ are of rare occurrence. The great majority are the result of direct injury or of ulceration, notably from ureteral calculi.

Etiology.—In earlier times it was not uncommon to observe ureteral fistulæ leading into the vagina or uterus as the results of lacerated wounds produced in labor. Such instances are now of less frequent occurrence.

Of all causes for the development of ureteral fistulæ at the present day, vaginal hysterectomy for cancer of the cervix stands first.

There is less danger of injuring the ureters in performing abdominal hysterectomy, though this operation is by no means unattended by this danger.

Operative Treatment.—Various methods are proposed for the closure of these openings, and no one is suitable for all cases. The following methods have been suggested:

1. Dissecting out the end of the ureter, splitting it longitudinally for the purpose of preventing contraction of the orifice, and transplanting the end into the base of the bladder.

2. Making a large vesicovaginal fistula near the ureteral fistula and closing the upper segment of the vagina so that the urine is directed through the opening into the bladder.

3. Making a large vesicovaginal fistula near the ureteral opening and denuding the vaginal wall between these openings and stitching a fold of vaginal wall over the interspace to form a channel through which the urine is directed from the ureter to the bladder.

4. Direct suture of a lateral opening into the ureter after denuding its margins.

5. Opening the abdomen, freeing the severed ureter, and transplanting it into the fundus of the bladder.

6. Removal of the kidney.

Ureteral Fistula at the Vault of the Vagina.—When the urine escapes from the ureter directly into the vagina a simple plastic operation *per vaginam* will usually effect a cure. The first step is to form an artificial vesicovaginal fistula as near as possible to the ureteral fistula, which lies in the vault of the vagina. Having done this the mucosa is then dissected about both fistulæ, forming a circular area of denudation within which are both the vesicovaginal and ureterovaginal fistulæ. Accurate approximation of the sides of the denuded area is then accomplished by passing interrupted chromic or silkworm-gut sutures.

In order that this operation be successful, there must be a suffi-

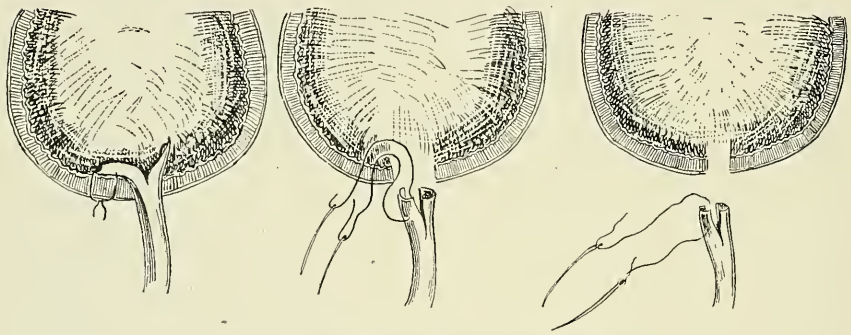
cient amount of loose vaginal tissue to allow the approximation of the margins of the area of denudation without undue tension.

Ureterocystostomy.—The transplanting of the divided proximal end of the ureter into the bladder is done only in the presence of a healthy ureter and kidney and when it is impossible to bring the divided ends of the ureter together by direct suture.

The ureter is to be transplanted into the bladder at a point which will provide for sufficient laxity of the tissues; too great tension will result in the giving way of the sutures.

A median abdominal incision is made above the pubis. The divided end of the ureter is found and enlarged by an incision about 2 cm. in length to prevent subsequent closure of the end.

Fig. 573 Fig. 574 Fig. 575



Transplantation of the ureters into the fundus of the bladder.

An opening is then made through the bladder wall large enough to admit the end of the ureter. Long forceps are next passed through the urethra and bladder and out through the opening into the bladder. With these forceps the end of the ureter is grasped and drawn into the bladder. Interrupted sutures of linen are then passed through the bladder and ureteral walls, but not penetrating them. Four to six such sutures are required.

When the ureter is severed in the course of an abdominal operation and the divided ends cannot be brought together by sutures, the next consideration is uterocystostomy. Failing in this the choice lies between ureterostomy and nephrectomy. If the condition of the patient is such as to render immediate nephrectomy hazardous, the divided end of the ureter should be brought through an opening in the abdominal wall (ureterostomy) and left there until such time as the condition of the patient will permit of nephrectomy.

Uretero-ureterostomy is the splicing of the divided ureter and is the operation of choice when the kidney, ureter, and periureteral tissues are healthy and when the divided ends can be approximated without undue tension.

Nephro-ureterectomy.—As a last resort the kidney and ureter must be sacrificed. This should not be done unless their integrity is destroyed and unless the other kidney is sufficiently sound to permit the patient to live in comparative health. If the condition of the patient is such as to render an extensive operation extrahazardous, the kidney may be removed alone and the ureter at a later date. It is best, however, to remove them together when possible, provided too great risk is not entailed.

CHAPTER XXXII

DISEASES OF THE URINARY SYSTEM

- Diseases of the Urethra and Bladder
  - Anatomy and Physiology
  - Methods of Examination
    - Percussion
    - Palpation
    - Catheter and Sound
    - Inspection
    - Urethroscopy
    - Cystoscopy
  - Malformations and Diseases of the Urethra
    - Congenital Malformations
      - Partial or Complete Absence
      - Atresia
      - Displacement
      - Epispadias
      - Hypospadias
    - Acquired Malformations
      - Dilatation
      - Stricture
      - Dislocations
      - Prolapse of the Urethral Mucous Membrane
  - Urethritis
    - Acute
    - Chronic
  - Newgrowths of Urethra
    - Caruncle
    - Fibroma
    - Carcinoma
    - Sarcoma
    - Foreign Bodies
- Diseases of the Bladder
  - Developmental Deformities
    - Vesical Fissures
    - Double Bladder
    - Loculate Bladder
  - Malpositions and Malformations
    - Eversion
    - Hernia
  - Foreign Bodies
  - Cystitis
  - Hyperemia
  - New-formations
    - Myoma
    - Fibroma
    - Papilloma
    - Adenoma
    - Dermoid Cysts
    - Carcinoma
    - Sarcoma
- Diseases of the Ureters
  - Anatomy and Physiology
  - Methods of Examination
    - Palpation
    - Inspection
    - Catheterization
    - Examination of Urine
  - Congenital Anomalies
  - Inflammations of the Ureter
  - Obstructions of the Ureter
    - Ureteral Calculus
    - Stricture

DISEASES OF THE URETHRA AND BLADDER

Winckel, in his monograph on *Diseases of the Female Urethra and Bladder,* has pointed out that much that is now known of the diseases of the urethra and bladder was known hundreds and thousands of years ago, and, having been forgotten, was rediscovered by late observers. The Cnidian school possessed a fairly accurate knowledge of diseases of the bladder, as did the Indians 100 B.C. Ætius (502–575 B.C.) described ulcerative affections of the bladder, and Paul of Ægina

(670 A.D.) treated diseases of the bladder by means of injections through a catheter. In the nineteenth century Simon devised a series of conical specula with obturators, by which the urethra could be dilated to an extreme degree, permitting a digital examination of the bladder. From that time to the present, methods of examining the urinary tract have been rapidly introduced and perfected. We are especially indebted to Max Nitze, K. Pawlik, M. Sänger, and Howard Kelly, whose contributions to this department of the diseases of women rank with the most important of the past century.

The Anatomy and Physiology of the Urethra and Bladder.—Urethra.—The average length of the female urethra is one to one and a half inches. It runs from below upward and backward in a straight or slightly curved line, and its anterior extremity lies about four-tenths of an inch below the symphysis.

The wall of the urethra is about one-fifth of an inch thick, and possesses an unusual amount of elastic fiber, which permits a great degree of stretching. The epithelium in the lower segment of the urethra resembles the stratified epithelium of the vagina, while that of the upper segment is like that of the bladder.

Near the external urethral orifice Skene found two crypts which he regarded as glands. They are known as Skene's ducts. Their orifices, which open into the urethral canal, are about one-twentieth of an inch in diameter. The ducts are about one-quarter of an inch long and run upward along the wall of the urethra. A fine probe can be inserted into them for about one inch.

Numerous smaller crypts lie along the course of the urethra. These are lined with transitional epithelium, the lowermost layer being a single row of cylindrical epithelium. Higher up the epithelium becomes stratified, cylindrical, and near the mouth of the ducts is flat pavement epithelium. In addition to these lacunæ there are numerous small mucous glands opening into the canal. Beneath the mucosa is the submucosa which is composed of an elastic network, and external to this is the muscular wall, composed of longitudinal and circular muscle fibers.

The external orifice of the urethra is a vertical oval opening one-fifth of an inch long, while the internal orifice is a mere slit.

Bladder.—The empty female bladder lies in the median line behind the pubis and in front of the vagina. When the bladder is distended it inclines slightly to the right side and may reach to the level of the umbilicus. The average capacity is 400 c.c., which is somewhat less than that of the male bladder. The minimum capacity is 20 to 30 grams, and the maximum 3320 c.c. (Fritsch). The bladder wall consists of three layers—peritoneal, muscular, and mucous.

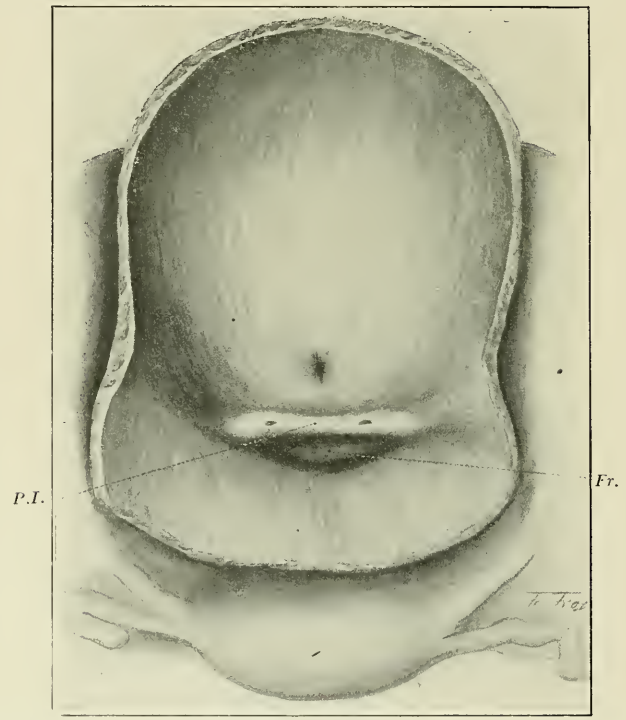
1. The *peritoneum* covers the fundus of the bladder and is reflected to the anterior surface of the body of the uterus and to the anterior abdominal wall. It is loosely adherent to the muscularis. When the bladder is greatly distended, the peritoneum is so drawn upward that a hand's breadth of the bladder not covered with peritoneum presents

above the pubis—a fact to be remembered in suprapubic operations on the bladder.

2. The *middle layer* consists of unstriped muscle fibers arranged in three sublayers, namely, an external layer of longitudinal fibers, a middle layer of oblique and transverse fibers, and an internal layer of longitudinal fibers.

3. The *internal layer*—mucosa—is composed of several layers of transitional epithelium resting upon a loose connective-tissue base. Folds or rugæ are found over the entire inner surface of the bladder, with the exception of the trigone and openings. These are due to laxity of the mucosa. In the trigone the mucosa closely adheres to the submucosa, and therefore no folds are to be seen. Small acinous glands which secrete mucus are distributed in the mucous membrane of the fundus and about the internal sphincter.

Fig. 576



Bladder opened, showing relations of the ureteral openings, urethral opening, and the interureteric ligament. *P.I.*, interuteric ligament; *Fr.*, fossa retro-ureterica. (Leipmann.)

The bladder is rich in bloodvessels. A thick, capillary network runs beneath the superficial epithelium of the mucous membrane. The vertex is not so richly supplied with bloodvessels as the deeper parts. The arteries supplying the bladder are the superior and inferior

PLATE XXXVII

Figure 1. Linear Ulcer of Bladder Mucosa. Magnified.

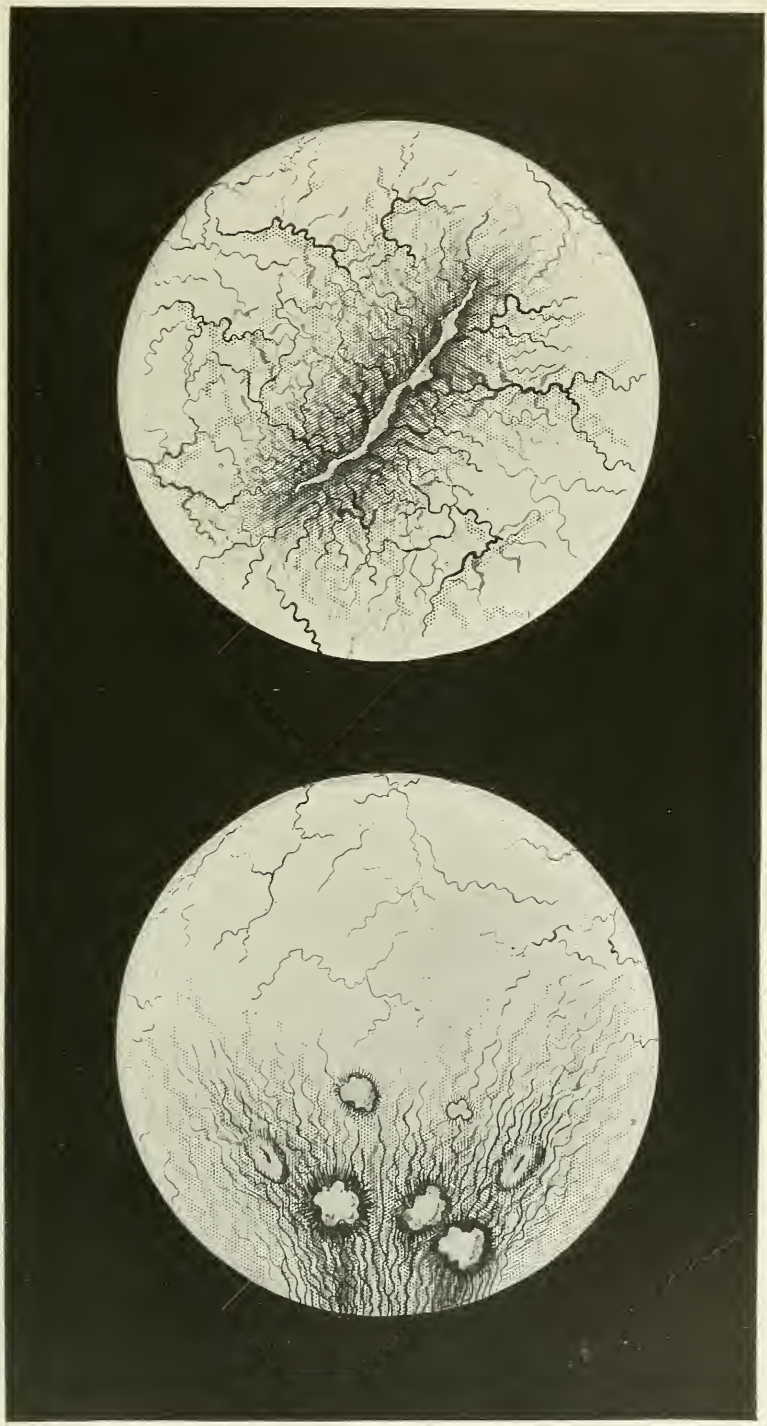


Figure 2. Ulcerated Patches in the Trigone. Slightly Magnified.

PLATE XXXVIII

Figure 1. Cystitis originating in the Trigone and extending to Adjacent Surfaces. Magnified.

Figure 2. Normal Bladder Mucosa. Slightly magnified.

vesical branches of the arteria hypogastrica. The veins empty into the plexua pudenda vesicularis.

The nerve supply comes from the plexicus hypogastricus inferior of the sympathetic system and from the third and fourth sacral nerves.

The bladder has three openings: the internal orifice of the urethra and the two orifices of the ureters, which lie one and one-half inches above and to either side of the urethral opening. The ureteral openings are separated about one inch and are connected by a prominent fold of the mucous membrane, known as the ligamentum uretericum. The three openings forming the angles of a triangle are known as the *trigone*. Above the trigone, on the posterior wall of the bladder, is the *bas fond*, and all the bladder lying above the level of the ureteral openings is known as the body or fundus. That portion called the sphincter vesicæ probably consists solely of the folds of mucous membrane at the internal orifice of the urethra.

Physiology of the Bladder.—The ureters and bladder possess peristaltic movements by which the urine is forced through the ureters into the bladder and from the bladder past the sphincter internus. These systolic and diastolic movements of the bladder have an important clinical bearing in that rest cannot be given to the inflamed bladder without artificial drainage. The anterior wall of the empty bladder lies upon the posterior wall. When the urine enters the bladder it first gravitates to the side pockets and gradually elevates the anterior wall. Before the bladder is distended, the walls are lax and flat; after distention they become tense and rounded.

Topography of the Bladder.—By the present perfected methods of examination it is possible to bring into view and to directly treat all lesions of any portion of the bladder; hence the necessity of exact means of describing the location and extent of these lesions. The following scheme of divisions and subdivisions of the interior of the bladder is proposed by Howard Kelly:

1. The natural landmarks within the bladder.
2. The relation of the bladder to surrounding structures.
3. An artificial division into hemispheres and quadrants.

1. The Natural Landmarks in the Bladder.—(*a*) The internal orifice of the urethra marks the junction of the urethra and bladder.

(*b*) The ureteral orifices are to be regarded as the most important of the landmarks of the bladder. The orifices lie at the top or to one side of the so-called ureteral prominences, which are truncate cones 5 x 3 mm.

(*c*) Ureteral folds is a name given by Kelly to designate rounded elevations sometimes seen in the mucosa, stretching backward and outward from each ureteral opening toward the pelvic walls for a distance of about three-quarters of an inch. They are regarded by Kelly as the terminal ends of the ureters as they pass through the bladder walls.

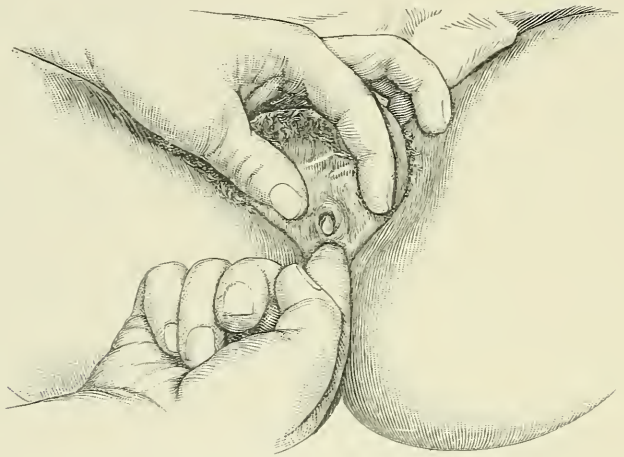
(*d*) The trigone is a triangular area at the base of the bladder, having angles formed by the internal urethral and the two ureteral openings;

the sides connecting these openings bound the trigone and are about one inch long at the base and three-quarters of an inch long at either side. Many of the lesions of the bladder are confined to this area.

(*e*) The interureteric ligament connects the ureteral eminences and is seen as a line, sometimes elevated which separates the smooth, deeper colored surface of the trigone from the paler surface of the bladder.

(*f*) Kelly calls attention to the important points relating to the fixed and movable portions of the bladder. As the bladder is emptied the upper and more movable portions settle down into the lower and more fixed portions, like one saucer within another. He observes that the location of inflammatory lesions is determined somewhat by the movable and fixed areas. Viewing the interior of the bladder with a cystoscope, the respiratory movements define the movable area as contrasted with the fixed portion.

FIG. 577



Expression of pus from the ducts of Skene's glands. (Kelly.)

The edges in which the two saucers meet, form three folds, a posterior and two lateral folds. The apices formed by the meeting of these folds are known as the right and left vesical cornua.

2. RELATIONS OF THE BLADDER TO SURROUNDING STRUCTURES.—The trigone lies in close proximity to the anterior vaginal wall. Above this the base of the bladder is in direct apposition to the supravaginal portion of the cervix. The upper half of the bladder is loosely covered with peritoneum. The above relations are important in operative procedures upon the bladder and surrounding structures.

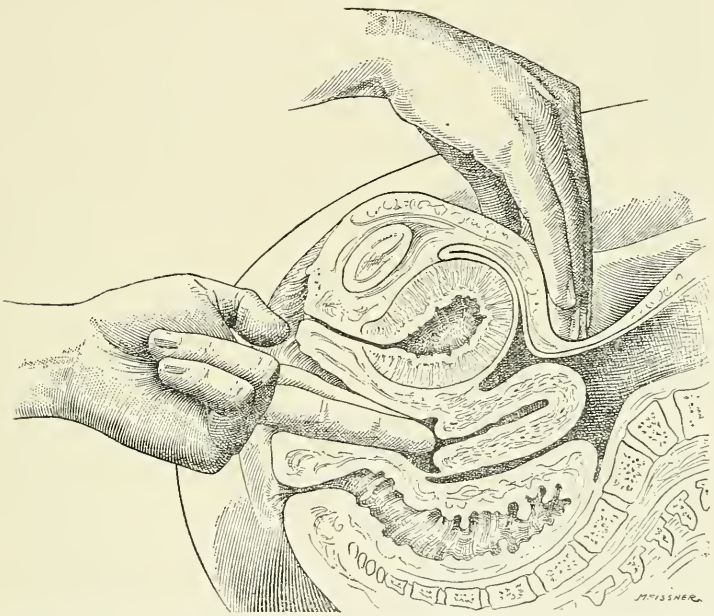
3. ARTIFICIAL DIVISION OF THE BLADDER INTO HEMISPHERES AND QUADRANTS.—The distended bladder may be regarded as a sphere divided into right and left hemispheres. The intersection of sagittal and horizontal planes further divides the bladder into quadrants—the right upper and lower quadrants and the left upper and lower quadrants.

Methods of Examining the Urethra and Bladder.—1. **Percussion.**—A bladder distended with fluid may be outlined by percussion. The area of dulness may extend to the umbilicus. The more distended the bladder, the more conical the shape. A bladder distended with air gives a high-pitched tympanitic note.

2. **Palpation.**—Many of the lesions of the urethra and bladder are detected by palpation.

(*a*) The urethra is directly palpated along the median line of the anterior vaginal wall. In urethritis palpation will be painful in proportion to the intensity and extent of the inflammation; the urethra may be felt as a firm cord. Fissures and caruncles at the urethral orifice are exquisitely sensitive to pressure. By previously dilating the urethra with bougies, it is possible to insert the finger through the urethra into the bladder for the purpose of detecting irregularities and foreign growths. Such overstretching often results in a temporary incontinence.

FIG. 578



The thickened bladder is engaged between the index and middle finger of the left hand in the vagina and the fingers of the right hand over the abdomen.

(*b*) The bladder when empty is seldom recognized in a bimanual examination. In cystitis tenderness and pain are proportionate to the intensity and extent of the lesion. In chronic cystitis, and particularly in tuberculous cystitis, the thickened bladder wall may be distinctly palpated through the vagina. Stone may sometimes be palpated and outlined in an abdominovaginal examination.

Kelly recommends placing the patient in the knee-chest position

and letting the air distend the vagina, when the fingers of both hands can be brought close together and the entire bladder be distinctly outlined.

While possible to palpate a portion of the interior of the bladder through the dilated urethra, such a procedure is no longer to be recommended in view of the more efficient and less objectionable method of direct inspection.

3. **By Catheter and Sound.**—By the use of the catheter the urine is evacuated from the bladder, free of contamination with products of the urethra and vagina. By the catheter foreign bodies, stricture, and fistulæ are sometimes detected in the urethra and bladder. The sound is a more efficient instrument for the detection of such conditions.

Fig. 579

Urethral calibrator.

4. **Inspection.**—Inspection of the urethra and bladder has been made possible by the contributions of Nitze, Casper, Pawlik, Skene, Simon, Kelly, and others. In almost all diseases of the urethra and bladder it is desirable to make an exact diagnosis by direct inspection.

The lesions involving the urethral orifice can be recognized by direct ocular inspection. Pus seen to ooze from the urethra is, with few exceptions, recognized as of gonorrheal origin. The orifices of Skene can be directly inspected by separating the lips of the urethra with the fingers. By separating the labia and introducing a speculum, direct inspection will disclose a vesicovaginal fistula, vesicocele, and tumors of the base of the bladder and urethra growing into the vagina.

Urethroscopy.—An endoscope is introduced the entire length of the urethra. Light is reflected by a head-mirror into the urethra as the instrument is withdrawn. The mucosa collapses about the end of the urethroscope, forming a flat funnel which can be directly inspected. By virture of the compression the mucosa is unnaturally pale. Polyps, newgrowths, foreign bodies, ulcers, and inflamed surfaces are thus brought into the field of vision and are made accessible to direct treatment.

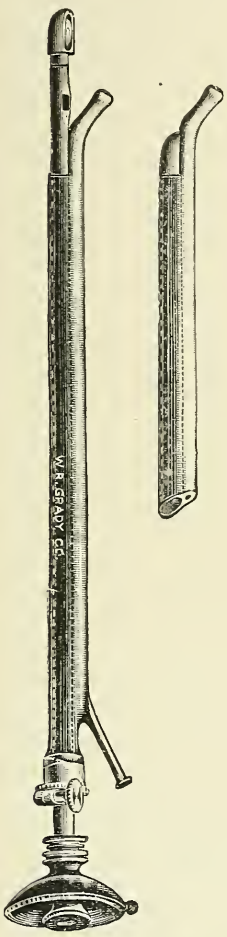
Cystoscopy.—Two methods of inspecting the interior of the bladder will be described—the Kelly-Pawlik and the Nitze. There are numerous modifications of these methods, all worthy of consideration were there space to devote to them.

The Nitze cystoscope is not in general use in the United States in cystoscopic examinations of women, preference being given to the direct method of Kelly and Pawlik. On the Continent the Nitze and various modifications, such as Casper's are quite generally used. Each has its merits, and is deserving of full consideration.

The following are the advantages of the Nitze cystoscope as compared with the Kelly-Pawlik:

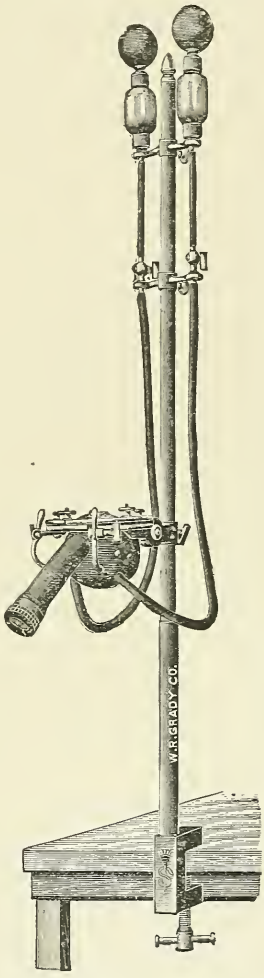
1. A general anesthetic is seldom required.
2. The lithotomy position is used to the best advantage.
3. The bladder is more completely dilated with water than with air.

FIG. 580



Nitze's ureter cystoscope for illuminating the bladder and simultaneous catheterization of the ureters.

FIG. 581



Janet-Frank's bladder phantom. Intended for practising cystoscopy, ureteral catheterization, and intravesical operations.

4. The urethra is not widely dilated, hence incontinence of urine seldom occurs.
5. No assistance is required in making the examination.
6. Less skill and a shorter time are required in making the examination.

Technic.—Four conditions are prerequisite to the use of the Nitze cystoscope:

1. Permeability of the urethra, sufficient to easily permit the passage of the cystoscope. This requires a diameter of not less than 10 mm.
2. A capacity sufficient to retain at least 100 c.c. of fluid.
3. Power on the part of the sphincter vesicæ to retain the fluid.
4. Transparent fluid.

1. Permeability.—It is essential that the cystoscope should pass into the bladder without meeting unusual resistance; otherwise the pressure on the mucus glands may smear the lamp with mucous secretion and thereby obscure the field of vision. When an obstruction exists in the urethra it must be removed before the cystoscope is introduced. Strictures and foreign growths of the urethra are uncommon in women. Spasmodic contractions of the sphincter vesicæ may obstruct the passage of the cystoscope, but this may be overcome by slow, continuous pressure and by an anesthetic.

2. Capacity of the Bladder.—The usual amount of fluid injected into the bladder preparatory to making a cystoscopic examination is 250 c.c. A capacity of less than 100 c.c. precludes the examination, because of imperfect distention of the bladder. If irritability of the urethra and bladder does not permit the retention of a sufficient amount of fluid with which to distend the bladder, it may be possible to overcome the irritability by the application of a 2 per cent. solution of cocaine to the sphincter vesicæ. Injection of the solution into the bladder is not regarded as a safe procedure. When this will not overcome the irritability, rest must be enjoined until it has subsided. In the absence of cystitis, the irritability readily responds to the influence of cocaine applied to the urethra.

Several fatal cases of cocaine poisoning have resulted from injection of the solution into the bladder.

If the indication for a cystoscopic examination is urgent in the presence of an irritable bladder and urethra, a general anesthetic may be given.

The female bladder will not distend so evenly as will the male bladder, because of the union of the posterior wall with the cervix and vagina, and because of the possible encroachment of the uterus, adhesions, pelvic tumors, and other swellings upon the bladder.

3. Integrity of the Sphincter Vesicæ.—If for any reason the bladder will not retain the urine, the Nitze cystoscope should be discarded in favor of the Kelly-Pawlik.

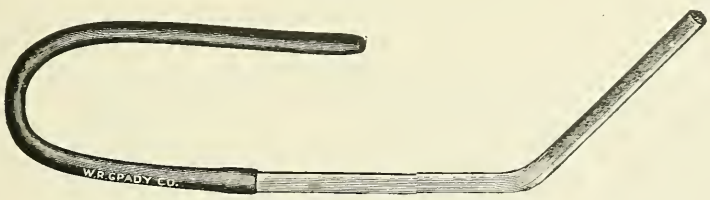
4. Transparent Medium.—The injected fluid must be sterile, non-irritating, and transparent. A normal salt solution, sterile water, or, preferably, a saturated solution of boric acid may be used. Carbolic acid, bichloride solution, and formalin are too irritating, causing an unnatural congestion of the mucosa.

The lithotomy position is preferred, the patient lying on a high table. The urethral opening is cleansed as for the passing of a catheter. The urine is then withdrawn through a soft-rubber or glass catheter,

and without withdrawing the catheter, the bladder is irrigated with a boric acid or normal salt solution. A fountain syringe may be employed, but a piston syringe holding 250 c.c. is preferred. When the injected fluid is returned clear, about 250 c.c. of the fluid is left in the bladder, preparatory to the introduction of the cystoscope. As a rule, the fluid returns clear after two or three injections. When there exists a sediment of mucus, blood, or pus several injections may be required, and there are cases in which it is impossible to bring about perfect clarity. In such cases the contained fluid is being continually contaminated by blood and pus from the kidneys and ureters. When this is the case a small amount of the fluid should be injected and the injection repeated before all of the fluid is returned. By taking this precaution the sediment at the bottom of the bladder will not be disturbed. Sometimes the mucus, pus, and concretions cling so tightly to the wall of the bladder that it is impossible to carry out a cystoscopic examination. The fluid may appear cloudy because the lamp is smeared with mucus in its passage through the urethra. In such case the instrument must be withdrawn and cleansed.

Cystoscopic Appearance of the Normal Bladder.—With the bladder moderately distended *the surface of the mucous membrane* is smooth. Circumscribed nodular swellings appear late in life and are caused by the intersection of muscular bands—the so-called trabeculæ, which traverse the wall in all directions. Such nodular elevations are not to be mistaken for tuberculous nodules. Between the trabeculæ, which cross one another at all angles, are irregularly shaped depressions. These are the forerunners of the pathological conditions known as diverticula and hernia.

FIG. 582



Glass tube with rubber catheter.

The color of the mucosa varies within wide limits. In the normal state this variation in color is found not only in different bladders, but in various portions of the same bladder. By reflected artificial light the normal color is gray or yellowish rose. The variations in color presented at different points in the bladder are accounted for by the relative position of the prism to the field of vision. For this reason the shades of color change with the movements of the prism. The nearer the prism approaches the surface, the brighter the color.

The *bloodvessels* appear as a fine network of veins and arteries; the base of the bladder is more vascular than are other portions. With

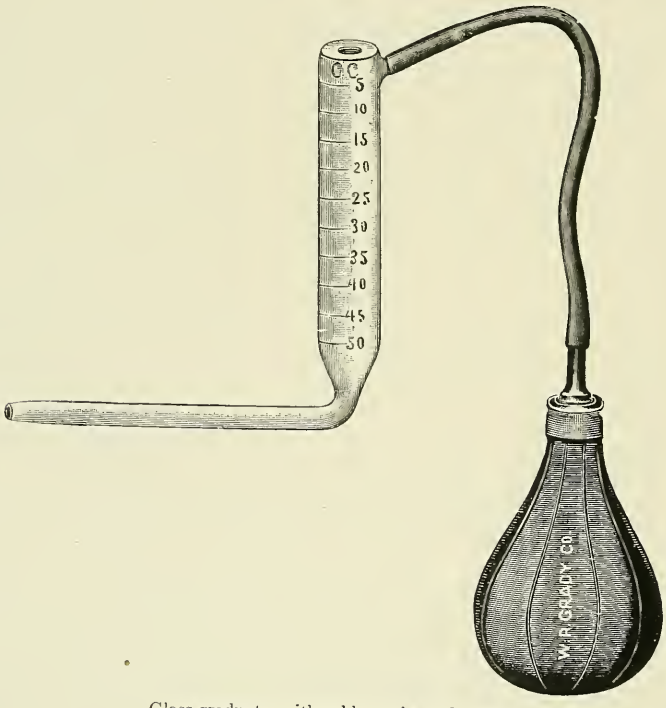
the exception of the field near the sphincter vesicæ the veins are rarely seen in the normal bladder.

From a clinical point of view the most important parts of the bladder are the *trigone* and *base*. Here foreign bodies and pathological lesions are most often observed. The trigone presents a smooth, glistening surface, varying in color from gray to dark red, and contains a close network of capillaries.

Fig. 583

Urethral dilator.

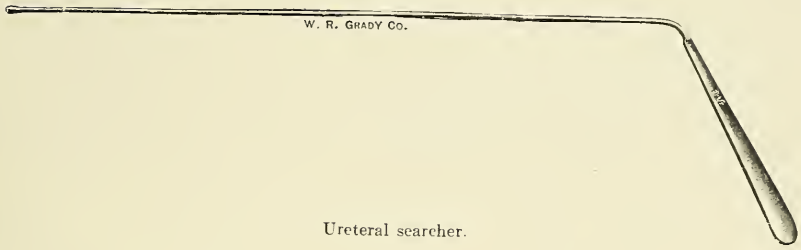
Fig. 584



Glass graduate, with rubber tube and bulb.

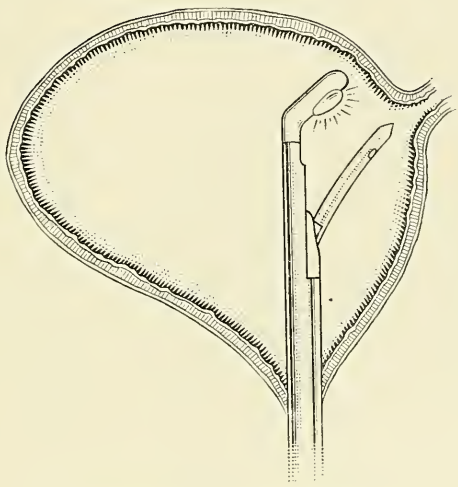
As the cystoscope is slowly introduced, the first image to greet the eye is that of the *sphincter vesicæ*, which appears in the upper or lower segment of the field of vision, depending upon the respective direction of the cystoscope; the image above is the lower segment of the sphincter,

Fig. 585



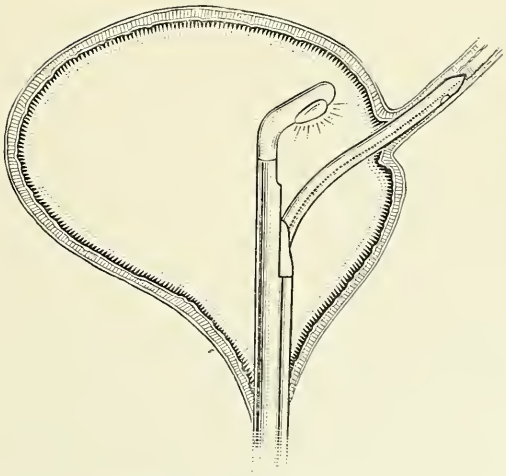
Ureteral searcher.

Fig. 586



Catheter directed to the ureteral opening

Fig. 587



Catheter passing into the ureter.

and *vice versa*. Pushing the instrument forward the image is slowly lost to view. At the base of the bladder the *ligamentum uretericum* is seen as a ridge of more or less prominence, running transversely for a distance of about one inch. Turning the instrument slightly to the right or left, the *ureteral prominence* is seen at the end of the ureteric ligament. The prominence varies in size, form, and color. This is

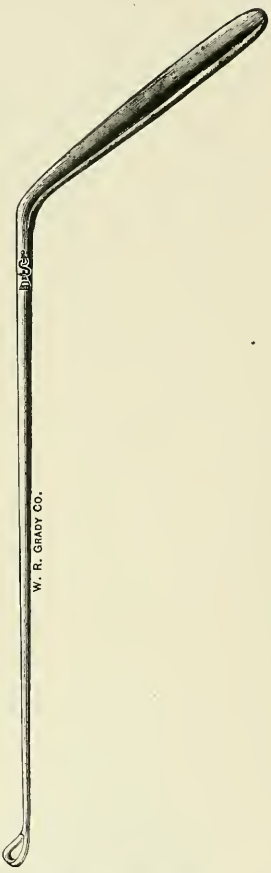
Fig. 588

Ureteral catheter, with handle sufficiently reduced to allow the speculum to be withdrawn after catheter is engaged in ureteral orifice.

Fig. 589

Delicate mouse-toothed forceps.

Fig. 590

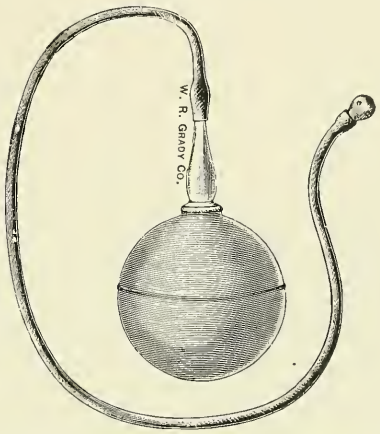


Vesical curet. (Kelly.)

often true of the two prominences in the same bladder. The image increases in size and transparency as the prism is moved toward the object, decreasing in size and becoming darker as the prism is withdrawn. It is important to look for small vessels radiating from the ureteral prominence, for at the point from which the vessels radiate the ureteral opening is found. It is often possible to see the ureteral openings in the centre or at one side of the prominence.

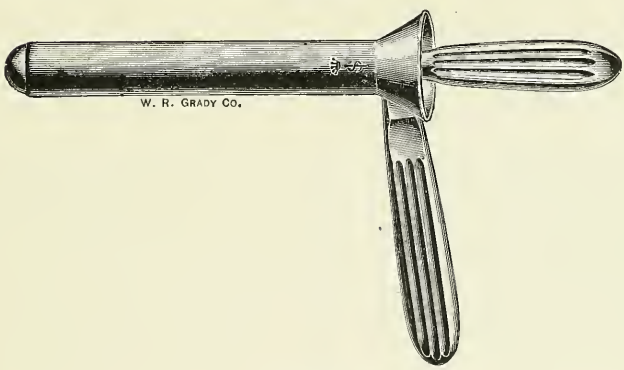
Difficulty in finding the *ureteral opening* is experienced when, as occasionally happens, the prominence is wanting. When one ureteral opening is found, the other is to be sought for at a corresponding point at the opposite extremity of the ureteric ligament. Slight variations in position are sometimes observed. One or both ureteral openings may be found close behind the sphincter vesicæ, or they may lie some

Fig. 591



Evacuator used for withdrawing residual urine.

Fig. 592

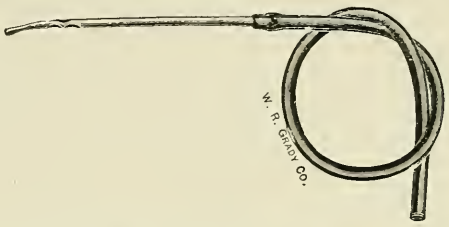


Cystoscope.

distance beyond the boundaries of the trigone. When it is seemingly impossible to discover the position of the ureteral openings, it is well to look for the ripple of the urine as it is discharged into the bladder from the ureters. When the ureteral openings are hidden from view by folds of mucous membrane, a greater quantity of fluid may smooth out the folds and present the ureteral openings to view.

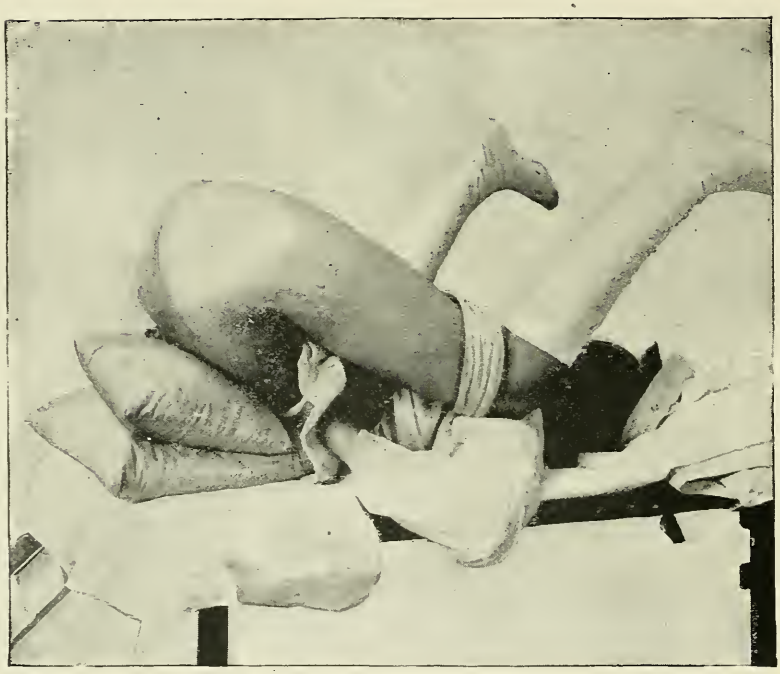
Air-bubbles are usually present. It is impossible to avoid introducing them, but they are no embarrassment to the examination. They are round, oval, or hour-glass in form, and move simultaneously with the contained fluid.

Fig. 593



Ureteral catheter with rubber tube.

Fig. 594



Dorsal position. Elevated pelvis. (Kelly.)

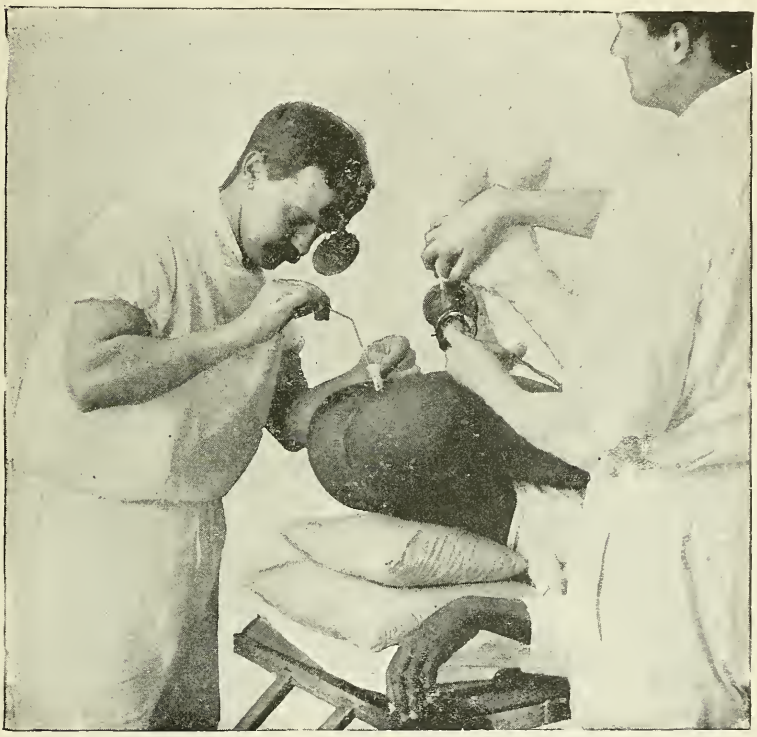
Movements of the bladder are seen, and are ascribed to the respiratory excursions and to the movements of neighboring structures.

Salt deposits of a red or grayish-white color are found on the surface of the bladder under perfectly normal conditions. They are distinguished from pus and tubercles by their color, their sharp outlines, and by the fact that they are a deposit upon and not an infiltration of the mucosa.

Small cystic elevations, the size of a pinhead, may extend over the entire surface of the bladder. They are particularly noticeable near the sphincter vesicæ. No pathological significance is to be attached to them.

The *Kelly-Pawlik method,* when efficiently carried out, is the most satisfactory of all methods of cystoscopy. The fundamental principles of a cystoscopic examination as given by Kelly are:

Fig. 595



Introducing searcher into left ureteral orifice. (Kelly.)

1. The introduction of a simple cylindrical speculum into the bladder.
2. The atmospheric distention of the bladder, induced slowly by posture.
3. The illumination and inspection of the vesical mucosa, either by means of a direct light, such as a small electric lamp attached to the examiner's forehead or to the mouth of the speculum, or by means of a strong light reflected by a head mirror.

The Technic of the Examination.—The field of operation, the instruments used, and the hands of the operator are to be sterilized as for

an operation. The bladder and bowel should be emptied immediately before the examination.

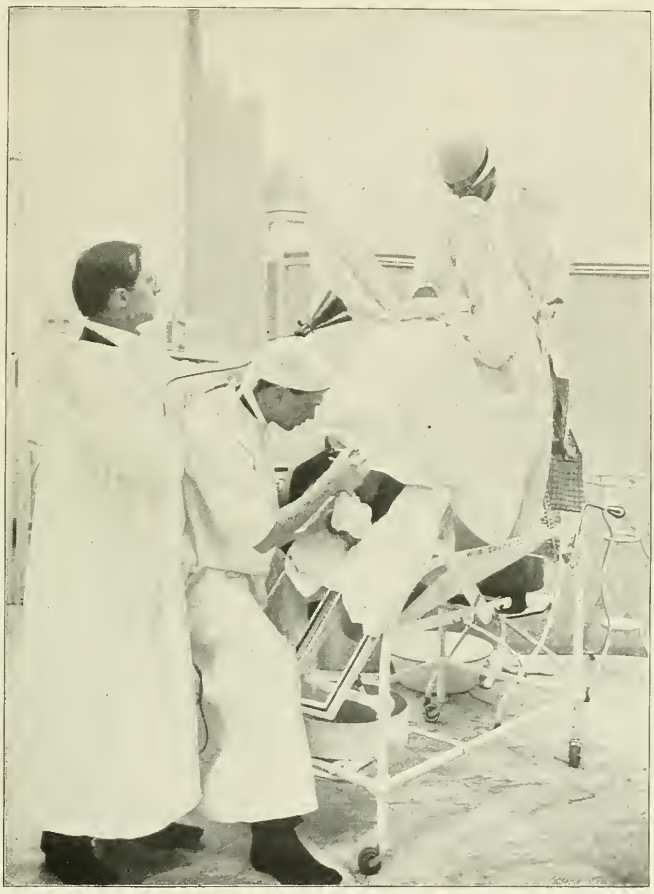
Fig. 596

Boldt table for cystoscopic examination.

On account of nervousness on the part of the patient or unusual irritability of the urethra, ether anesthesia may be chosen. In the majority of cases no anesthetic is required. Kelly recommends the application of a 10 per cent. cocaine solution to the urethra just within the external orifice. The application is made on a pledget of cotton wound on a metal rod. By this means the urethra can be dilated to the required degree without great suffering.

The Posture of the Patient.—Kelly recommends the elevated dorsal and the knee-chest positions. While the *elevated dorsal position* is the most convenient and least fatiguing to the patient, it is not so efficient, because the bladder does not distend so perfectly as in the knee-chest position.

Fig. 597



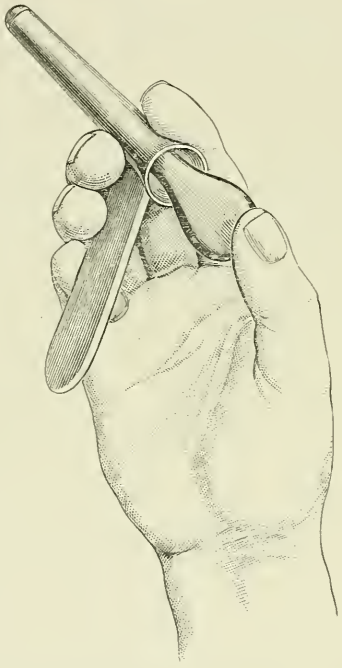
Cystoscopic examination. (Webster.)

In the elevated dorsal position the hips are elevated eight to twelve inches from the table by firm pillows. The head and thorax rest on the table. In order to secure perfect distention of the bladder, the patient may first assume the knee-chest position and a catheter be introduced into the bladder, through which the air may enter. In a minute or two the patient may resume the elevated dorsal position, taking care that the hips are constantly held at a higher level than the abdomen. Thus the weight of the small intestines is taken from

the bladder, and when the urethra is dilated, the bladder will be perfectly distended.

The *knee-chest position* is preferred by Kelly, who regards it applicable to all cases. When the patient can endure the exertion no anesthetic need be given. The patient kneels close to the edge of a firm table. The hips are kept at the greatest elevation, while the breast and side of the face lie flat upon the table. The small of the back curves inward. The knees are separated about twelve inches. When an anesthetic is required, the body may be supported by an apparatus shown in Fig. 596, or by an assistant at either side.

Fig. 598



Hand holding cystoscope in act of introduction. (Kelly.)

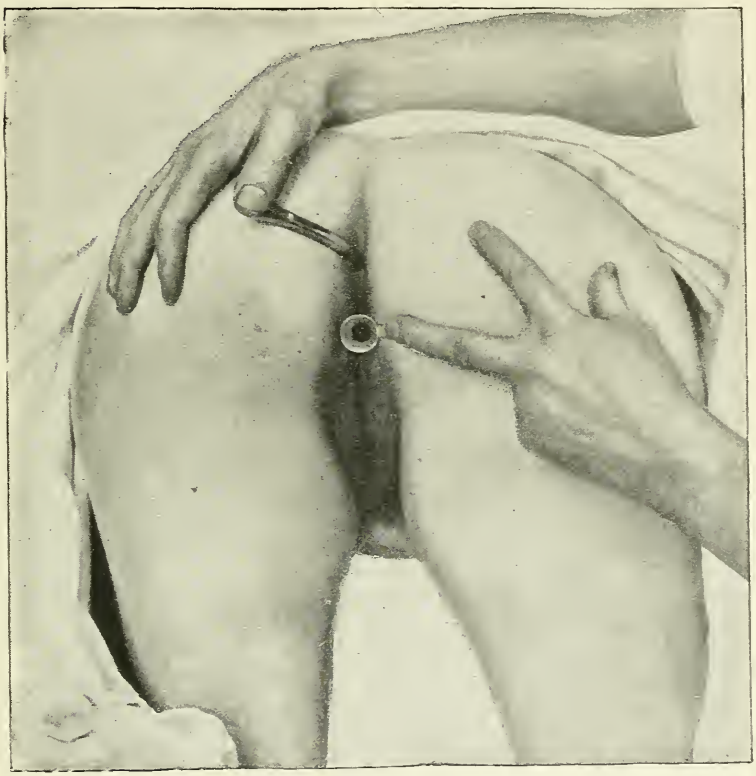
The elevated lithotomy position is of immense advantage over the dorsal and knee-chest positions advocated by Kelly. During the past fifteen years Webster[1] has employed the following method:

"The patient is placed on a Boldt operating table in the lithotomy position, the ankles being fastened to upright rods, the buttocks projecting slightly over the end of the table and resting on a rubber pad. A steel bar, with two padded supports, is attached to the top of the table so as to support the shoulders. After the external genitals and vagina

[1] Journal of the American Medical Association, May 17, 1902.

are cleansed, the patient is enveloped in sterile sheets, the urine is withdrawn from the bladder, the urethra is dilated to the necessary size, and a speculum containing its obturator introduced into the urethra. By means of a crank the top of the table is turned on a transverse axis so that the lower end is elevated and the upper end depressed. The patient is thus made to rest on an inclined plane, being held by the shoulder supports, her trunk being flat against the table and not bent in any way, so that her respiration is free and the anesthetic easily

FIG. 599



Knee-breast position. Cystoscope introduced; sound shows position of anal orifice. (Kelly.)

administered. The table top is usually raised until its lower end is twenty-three inches above the normal level. The obturator is then removed from the speculum, allowing air to enter and dilate the bladder. The examination of the bladder and ureters is then carried out, the examiner standing on a stool so the eyes may be well above the outer end of the speculum.

"This posture has all the advantages of the genupectoral position and none of its disadvantages. In difficult cases in which the distention

of the bladder has not been throughly satisfactory I have not been able to get better results by trying the genupectoral position."

Dilating the Urethral Orifice.—The dilators are lubricated with sterile glycerin, and introduced into the urethra by a boring motion. It is well to first calibrate the urethral orifice in order to select the proper size of dilator. The small end of the conical dilator is crowded into the urethra until it meets with resistance. The index finger is so placed as to mark the point in contact with the urethral orifice. This point indicates the diameter of the urethra. A diameter below ten millimeters will probably require dilating. A dilator slightly less in diameter than the calibrator is chosen, and larger dilators are successively employed until the diameter of the urethra is increased to the desired degree. When the orifice is unusually resistant and small, Simon suggests cutting it posteriorly.

FIG. 600

Downes' segregator.

Introduction of the Speculum.—The size of the speculum should vary from No. 7 to No. 12, according to the case. When the urethra is small and sensitive, No. 7 or No. 8 may best answer the purpose. With experience a No. 10 will be satisfactory in the majority of cases. The urethral orifice is cleansed with boric acid, an assistant holds the labia and buttocks apart, while the operator grasps the speculum, as shown in Fig. 598, and gently forces it through the urethra into the bladder. The obturator is held in place by the thumb until the cystoscope has entered the bladder, when it is withdrawn. A head mirror reflects the light from an electric drop lamp.

The interior of the bladder should be explored systematically, moving the speculum from side to side and up and down as the occasion requires.

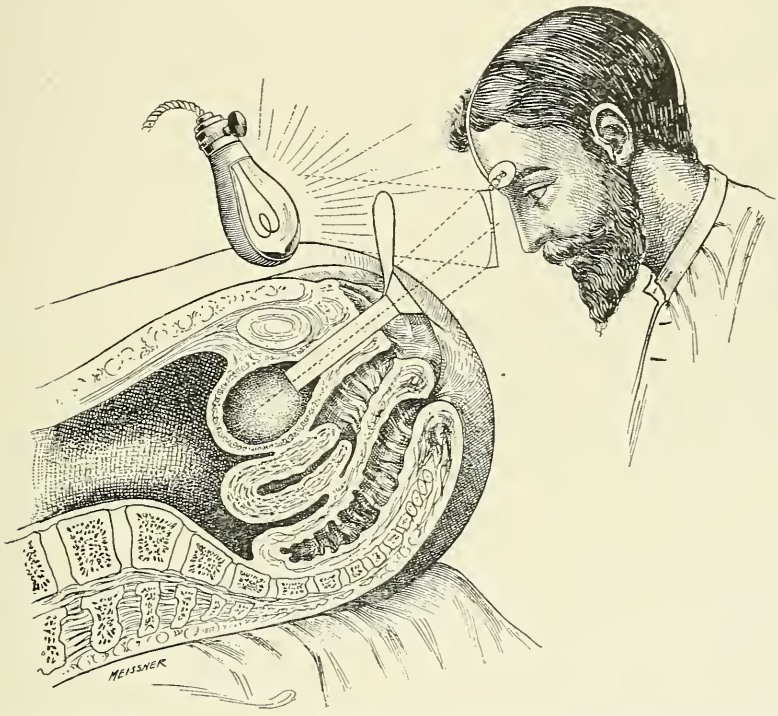
The Segregator.—By this ingenious instrument, first introduced by Harris and modified by Downes, the urine is separately collected from each ureter as it passes into the bladder.

Two catheters are arranged side by side within a flattened tube, each separate and movable on its longitudinal axis. When introduced into the bladder, the catheters are rotated outward on their long axes and separated at the bladder end. A metallic lever introduced into the vagina of the female and into the rectum of the male provides a water-shed in the bladder, on either side of which the urine is collected from the corresponding kidney. The urine flows through the catheters into bottles. The application of the segregator is simple and has the great advantage of collecting the urine from either kidney separately

without catheterizing the ureters. However, it has not proved of universal value.

Malformation and Diseases of the Female Urethra.—I. **Congenital Malformations.**—Congenital malformations of the urethra are uncommon. They consist of partial or complete absence of the urethra, atresia, displacements, epispadias, and hypospadias.

Fig. 601



Kelly-Pawlik method of cystoscopy. The hips are elevated, the bladder is distended with air, the cystoscope is inserted into the bladder, and artificial light is directed through the cystoscope into the bladder.

1. Partial or Complete Absence.—Partial or complete absence of the urethra may occur in the presence or absence of other congenital malformations of the genito-urinary tract. All trace of the urethra may be wanting, in which case the bladder and vagina may form a single cavity.

2. Atresia.—Atresia of the urethra as a congenital defect is almost invariably associated with malformations of the bladder, vagina, and uterus. An outlet for the bladder is commonly found to communicate with the vagina or through the patent urachus to the navel. If no such communication exists, the bladder, ureters, and kidneys will be widely distended. When the atresia is complete a channel must be made for

the escape of the urine. This may be done through the symphysis or urachus.

3. Displacement of the Urethra.—The usual form of displacement is that associated with a cystocele, in which the urethra is carried downward and forward with the bladder. It is possible for the entire urethra to protrude through the vulvar outlet. The canal may then be so distorted as to render the passage of a catheter or sound difficult. The urethra may also be displaced upward by a distended bladder, a pregnant uterus, or by subperitoneal tumors of the uterus which elevate the bladder.

The *treatment* consists of the correction of the associated lesions.

4. Epispadias.—Epispadias, including a defect in the upper wall of the urethra, a divison of the clitoris, and a separation of the labia minora, is exceedingly uncommon. The associated defects are separation of the symphysis and exstrophy of the bladder.

The *treatment* must necessarily be adapted to the existing conditions. The separated margins of the urethra are first denuded and then united with interrupted sutures. Following this, the remaining severed structures are denuded and united by sutures.

5. Hypospadias.—Hypospadias is a defect in the lower wall of the urethra, thereby establishing a communication between the urethra and vagina.

II. **Acquired Malformations.**—Acquired malformations of the urethra are dilatations, strictures, diverticula, dislocations, and prolapsus.

1. Dilatation of the Urethra.—Dilatation of the urethra may be confined to any portion or may involve all of the urethra. Dilatation of the entire urethra is usually the result of coitus or masturbation *per urethram;* more rarely from the presence of a newgrowth or foreign bodies. The partial incontinence of urine following repeated labors is undoubtedly due to injury to the circular fibers of the urethra. Incontinence of urine is an almost constant accompaniment. Local dilatation of the urethra, known as a urethrocele or diverticulum, affects the posterior wall of the urethra immediately back of the meatus. But few cases are recorded.

Treatment.—When the urethra has been recently dilated by the passage of a stone, instrument, or finger, or by childbirth, it is well to forego operative interference for a time in the hope that the urethra will resume its normal caliber. When lacerations exist they should be immediately sutured, but not if the parts are contused. Silk or linen may be used as sutures.

Four methods are proposed by Kelly for the relief of obstinate cases:

(*a*) A vaginal pessary.

(*b*) A longitudinal resection of the vaginal walls, with or without a piece of the urethra.

(*c*) An operation to flatten out and compress the external urethral orifice.

(*d*) Twisting the urethra spirally, so as to narrow its caliber.

Preference is given by Kelly to procedure (*b*).

F. Schatz has devised a funnel-shaped pessary which is so constructed as to directly press upon the urethra. When the vaginal outlet is relaxed, no good can come from the wearing of such a pessary.

Frank's method is as follows: A small catheter is placed in the urethra as a guide to the narrowing of the urethral canal. A wedge-shaped piece is then excised from the posterior wall of the meatus, including the vaginal wall as well as the urethra. This wedge should extend backward to within 1 cm. of the internal sphincter. The incision proceeds in an elliptical form beyond the neck of the bladder on the vaginal wall. Interrupted silk or linen sutures are used to close the incision.

Pawlik flattens the outer end of the urethra and bends it sharply. The urethral orifice is drawn well forward and turned to one side. He then marks the point on the side to which it may be drawn without undue tension and proceeds to denude a narrow area, about 2 cm. long, and sutures the urethral orifice to this raw surface. A week later the other side of the urethral orifice is drawn forward, and to the opposite side, where it is sutured to a similarly denuded area. This gives a sharp forward bend to the urethra and flattens it posteriorly.

Gersuny dissects out the entire urethra and twists it upon its long axis, and then holds it in place with sutures.

2. Stricture.—Stricture of the female urethra is uncommon as compared with urethral strictures in men. The causes of these strictures are:

(*a*) Cicatrization in the anterior vaginal wall following injuries through labor.

(*b*) Chronic urethritis, usually of gonorrheal origin, the most frequent cause of stricture in the female as well as in the male.

(*c*) Tumors of the urethral wall, which rarely constrict the urethra.

(*d*) Tumors about the urethra and displaced uteri directly constricting the urethra.

(*e*) Cicatrization following a chancre.

(*f*) Contraction of the urethra without an assignable cause.

The diagnosis is made from the difficulty and pain experienced in urinating and from the character of the flow, which comes in a fine stream or in drops. Not only the existence of a stricture, but its size, exact location, and the caliber of the urethra are diagnosticated by calibrating with bougies and by direct inspection through a urethroscope.

Treatment.—The treatment must necessarily be adapted to the form of the stricture and to its cause. The ordinary type of stricture, due to gonorrheal infection, should be dilated with bougies or incised. When the obstruction is due to malignant disease, the catheter must be employed to withdraw the urine, and when this becomes impossible a vesicovaginal fistula must be established. Cicatricial tissue in the anterior wall of the vagina may constrict the urethra. This may be incised, and if this fails, the entire cicatricial area may be excised

and the wound in the urethra carefully closed with silk or linen interrupted sutures.

3. Dislocations of the Urethra.—Dislocations of the urethra may occur in any direction, and such dislocations may involve the entire thickness of the urethral wall or merely the mucous membrane. Displacements of the urethra are not common, because of the anatomical relations, it being a short canal lying immediately underneath the symphysis and firmly embedded in connective tissue. Misplacement of the whole urethra is the usual occurrence, and is almost invariably secondary to a displacement of the bladder, as commonly observed in a vesicocele. Inspection and the use of the sound demonstrate the exact position of the urethra. The external orifice is directed forward and upward and the internal orifice backward and downward. The urethral canal may be so distorted as to render the passing of a catheter or sound difficult. Great difficulty may be experienced in voiding the urine. The urethra may be elongated and elevated by tumors, which draw the bladder upward; also by extreme distention of the bladder, and by the pregnant uterus.

4. Prolapse of the Urethral Mucous Membrane.—Prolapse of the urethral mucous membrane is of rare occurrence, and is usually observed in patients who have long suffered from dysuria and vesical catarrh. Displacements of the uterus and anterior vaginal wall are frequent accompaniments. Near the urethral orifice the mucosa is loosened and protrudes as a pale red or bluish, annular, or crescent-shaped fold of mucous membrane. This condition may occur at any age, but is more common in girls of a generally weakened constitution.

Treatment.—In very recent cases an attempt may be made to replace the prolapsed membrane. A weak solution of cocaine is used to deaden the sensation. Manipulations with the fingers may succeed in replacing the protruding structures, and a permanent result may be gained if the patient is kept in bed for several days and a firm vulvar pad worn.

When this method is not successful, and in all long-standing cases, the protruding mucosa should be excised with knife or scissors and the free margins united with fine chromic catgut.

Urethritis.—In the female as in the male, gonorrhea is the common cause of urethritis. In the absence of an established cause for urethritis the lesion is assumed to be gonorrheal in origin. Long after all clinical evidences of urethritis have disappeared, the gonococcus may inhabit the mucosa. Steinschneider examined thirty-four cases of recent gonorrheal infection and found the gonococcus in the urethra in all of them.

Sometimes the purulent secretion is seen to exude from the urethral orifice, but, as a rule, it is demonstrated by milking the urethra. (See Fig. 577.) So characteristic is a purulent discharge from the urethra, and so seldom is it found in other than gonorrheal infection, that it may be regarded as almost conclusive evidence of the gonorrheal nature of the lesion. A cover-slip preparation of all secretions of the

urethra should be made, and at the same time of any existing secretions from the cervix. If, as stated by Kelly, the gonococcus is found in the secretion of the cervix and not in the urethra, complicating urethritis may be assumed to be also due to gonorrhea. Suchanek found in 166 cases both the vagina and the urethra affected in 122 and urethral gonorrhea existing singly in only 3 cases.

No effort will be made to make a clinical distinction between the hyperemic and the inflammatory lesions of the urethra. They are dependent upon the same underlying causes, and only differ in degree. Hence, as additional causes which occasionally operate to bring about a congested or inflamed urethra, may be mentioned diseases of the bladder and kidneys, which extend to the urethra or in which the urine irritates the urethra. The mechanical irritation of the catheter, and infections acquired by the use of unclean catheters, are occasional sources. A urethritis sometimes complicates the infectious and contagious diseases. The wearing of an ill-fitting pessary, masturbation, and excessive sexual intercourse may result in urethral congestion. Urethritis is acute and chronic.

1. **Acute Urethritis.**—In this stage it is well to limit local examinations so far as possible. Under normal conditions the mucous membrane is pale red in color, and there is a slight glairy secretion. In the acute inflammatory stage, the mucosa about the urethral orifice appears red and swollen, sensitive to pressure, and secretes a variable amount of pus. In acute gonorrheal infection of the urethra there is at first a prickly, burning pain during and immediately following urination. Painful and frequent urination are constant symptoms. Three or four days later there appears at the urethral orifice a serous, sticky, transparent secretion, which by the eighth day becomes greenish and purulent, and continues so for about two weeks, when it decreases in amount, and by the end of the first month may have entirely disappeared. Vivid red points, which mark the mouths of infected glands, are often seen about the meatus. The discharge may cause an intense itching about the vulva. When it is desired to inspect the urethra, a 10 per cent. solution of cocaine should be applied to the orifice by a swab before introducing the urethroscope. Slight bleeding will be caused by the instrument. The congested mucous membrane will not appear so reddened because of the pressure of the instrument.

2. **Chronic Urethritis.**—Chronic urethritis exists as a diffuse or circumscribed lesion that is easily recognized through the urethroscope. The initial stage may be an acute infection, but more often it is chronic from the beginning. The secretion is limited; the mucosa is but slightly swollen, and is of a livid, blue color. There is little or no sensitiveness to pressure.

Treatment.—It is generally conceded that urethritis in the female is of gonorrheal origin in the vast majority of cases. It must be borne in mind that the disease may never have existed in the acute stage, and that it may be located in isolated areas, notably in the ducts of Skene. Many cases are overlooked or are regarded as cystitis for want

of an endoscopic examination. A urethroscopic examination should be made for the purpose of determining the existence of the lesion, its exact location, and its character.

No active local treatment should be instituted while the inflammation is in the *acute stage*. The patient should rest in bed, frequent hot vaginal douches of formalin, 1 to 3000, should be given, and the external parts bathed in lead-water and laudanum. Large quantities of water and milk should be drunk, to flush the urethra from above. All alcoholic drinks are prohibited.

While not convinced of the therapeutic value of urotropin in these cases, the author gives 7 grains three or four times daily. When there is much pain, belladonna or opium suppositories may be given per rectum. Sitz baths may also serve to relieve the distress. So long as the acute stage continues, no suppositories or solutions should be introduced into the urethra, for fear of causing the infection to extend.

In the *subacute* and *chronic stages*, topical applications should be applied.

Silver nitrate, 1 to 2000; protargol, 1 to 500; ichthyol, $\frac{1}{5}$ to 100; these with many other solutions have been used with varying degrees of success. That no one remedy has proved eminently satisfactory is evident from the large number of remedies advised, and the hopelessly divergent views of experts as to their proper application. In the chronic stage of gonorrheal urethritis, it must be remembered that the lesions are commonly localized in one or more areas, and are best treated with strong astringents and antiseptics, or the cautery, through an endoscope. For this purpose a 20 per cent. to 50 per cent. silver nitrate solution may be employed to good advantage, the applications being made with an applicator. Care must be taken not to overlook infected follicles, which, when found, must be opened and cauterized.

Jullien advocates ichthyol as a local application in gonorrheal urethritis. He swabs the urethral mucosa with a 10 to 20 per cent. solution of ichthyol in glycerin, using a cotton applicator.

General medication should be given a trial. The balsam of copaiba, 15 grains in capsules, is in general use. When there is pain on urination arhovin is said to be of service. It is given in capsules, each containing 4 grains, and administered every two to four hours. It is extolled as a sedative to mucous membranes.

While the urethra is being so treated, the infection existing in the genital tract demands attention. See Chapter XXIII on the Treatment of Gonorrhea in Women.

Newgrowths of the Urethra.—Newgrowths of the urethra are more common in the female than in the male. The following forms have been described:

1. Caruncle.
2. Fibroma.
3. Carcinoma.
4. Sarcoma.

1. **Caruncle.**—Vascular tumors of the urethra, the so-called caruncles, are most frequent. No age is exempt, but they are more common in advanced years. They are located at the urethral orifice, sometimes extending into the urethra. They are sessile or pedunculated, their form varying from flat and nodulated to pedunculated and crenated. The growth is very vascular, bleeding freely to the touch, and is sensitive to pressure. The surface is covered with pavement epithelium. In the connective-tissue stroma is an abundant distribution of nerve filaments and capillary bloodvessels; this supply of nerves accounts for the great sensitiveness to pressure and the pain in urinating. Sexual intercourse becomes intolerable, and the suffering racks the constitution.

The diagnosis can be made by direct inspection. When doubt exists as to the character of the growth, a microscopic section of the excised tumor should be made.

The treatment is excision and closure with fine catgut suture, or cauterization. Local applications are unsuccessful. A urethral speculum is required when the caruncle is situated high in the urethra.

The author's preference is for the thermocautery, applied under general anesthesia.

2. **Fibroma.**—But few cases are recorded.

3. **Carcinoma.**—Carcinoma of the urethra is rarely primary, but is not infrequently secondary to carcinoma of the vagina, cervix, and vulva. The author has found but twenty-eight cases of primary carcinoma of the urethra in the literature. The reported cases show a variety of anatomical forms: the papillomatous, nodular, smooth, and infiltrating, and, finally, the ulcerative. Almost all arose late in life, as is common with carcinoma.

The patient complains of burning and smarting while urinating; later there is more or less bleeding. The endoscope should be used in all cases when complaint of such symptoms is made. When in doubt as to the character of the growth, a portion may be excised or scraped from the suspected area and submitted to a microscopic examination. An interesting case is reported by Percy.[1] He calls attention to the great rarity of the lesion and the possibility of confusing cancer with syphilis of the urethra.

4. **Sarcoma.**—But four cases of primary sarcoma of the urethra have been described. One was a myxosarcoma, another a melanosarcoma.

Foreign Bodies in the Urethra.—Foreign bodies in the urethra are rarely found. They are introduced from without in masturbating or in the passage of sounds and catheters, or a vesical stone may lodge in the urethra.

The diagnosis is based upon the complaints of frequent and painful urination, the presence of pus, blood, and mucus in alkaline urine, and the finding of a foreign body by palpating the course of the urethra

[1] American Journal of Obstetrics, April, 1903.

through the vagina, by sounding the urethra, and by the use of the urethroscope.

Calculi in the urethra are almost invariably composed of phosphates.

Stone lodged in the urethra may be removed by forceps or a wire curet. The forefinger of the left hand is passed into the vagina to steady the stone while it is being retracted. When extraction fails the stone must be cut down upon through the anterior wall of the vagina, and after its retraction the opening is closed with interrupted sutures of silk, linen, or chromic catgut and a self-retaining catheter introduced for three to five days.

DISEASES OF THE BLADDER

The vesical diseases of women differ materially from those of men, and are deserving of special consideration. We will consider:

1. Developmental deformities.
2. Malpositions and malformations.
3. Foreign bodies.
4. Inflammations.
5. New-formations.

1. **Developmental Deformities.** — (*a*) **Vesical Fissures.** — Vesical fissures (exstrophy) are the most frequent and important of the congenital deformities of the bladder. They depend upon a deficiency of the anterior wall, and are mostly associated with developmental defects in the genital organs. Various grades of this maldevelopment are observed. It may consist of a simple cleft of the most dependent portion of the bladder or is less frequently located near the umbilicus. In the other extreme may be found an absence of the entire anterior wall of the bladder. A corresponding portion of the abdominal wall is cleft, and the gap is filled with a swollen, red, mucous membrane continuous with the external skin. The pubic bones are separated one-half to three inches and are connected by a fibrous band. The urethra is usually wholly wanting and not infrequently the clitoris is bifurcated. It is possible for the vagina and uterus to be divided by a septum, or for two separate vaginæ and a bicornate uterus to exist in connection with the fissured bladder. At times the posterior wall of the bladder inverts through the abdominal fissure. According to Voss, a distended bladder in the fetus accounts for these deformities. The distended bladder forces the horizontal rami of the pubes apart, then ruptures and establishes a communication between the bladder and the abdominal cleft.

Diagnosis.—The diagnosis is based upon direct inspection of the protruding bladder. The red mucous membrane of the bladder is sensitive to the touch, the ureteral openings may be visible, and urine may be seen dribbling from the ureters. The lower margin of the fissure is reddened and eroded, and burns and itches from irritating urine.

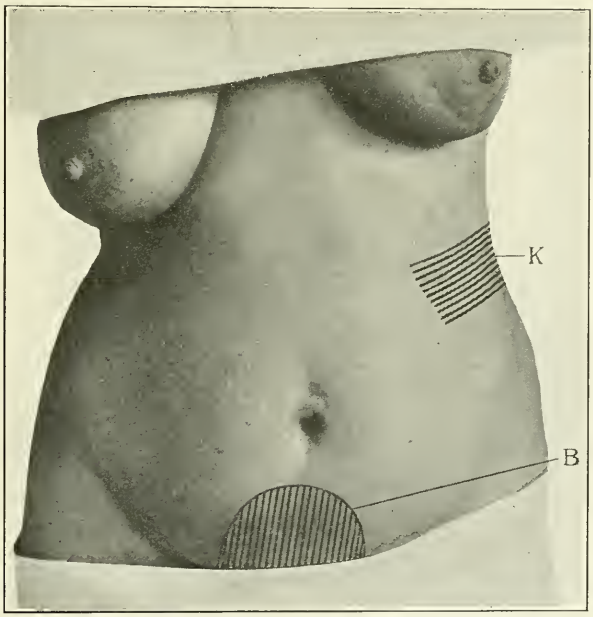
As to the frequency of occurrence, Winckel reports two observed cases, and Sickel found 2 cases in 12,689 newborn children.

Treatment.—For the extreme cases there is little that is promising in the treatment. When there is no greater defect than the presence of a vesico-umbilical fistula, a funnel-shaped area of denudation is made and the surfaces approximated with non-absorbable sutures. In all cases with a defective urethra, no attempt at closure of the fissure should be attempted unless it is first possible to establish a vesicovaginal fissure. This is often impossible because of an associated closure of the vagina. Some relief may be afforded by a partial closure of the fissure. This is done by covering the fissure throughout its greater extent with flaps of skin from the abdominal wall.

(*b*) **Double Bladder.**—Double bladder is due to a failure of the two parts of the allantois to fuse in early fetal life. But few cases are recorded.

(*c*) **Loculate Bladder.**—Projections are sometimes seen on the outer surface of the bladder, formed by diverticuli of the bladder wall. They are congenital defects, and are not to be confounded with diverticuli of inflammatory origin. They have been mistaken for supernumerary bladders.

FIG. 602



Locations of pain referred to the kidney (*K*) and bladder (*B*).

2. **Malpositions and Malformations.**—The female bladder is subject to malpositions and malformations to a far greater degree than is that of the male.

The normal position of the bladder is in the median line. In moderate distention the greatest diameter is transverse, and in extreme distention the greatest diameter is the vertical. The distended bladder may incline considerably to the right or left of the median line and may reach the level of the umbilicus. The author recalls seeing in Vienna a postmortem examination of a patient in whom the bladder had been opened and stitched to the abdominal wall in the right lower quadrant of the abdomen. The bladder, which was greatly distended, lay to one side of the median line, and was thought to be a broad ligament cyst. The mistake was discovered in the postmortem examination.

Elevation of the bladder occurs when the pelvis is filled with a tumor mass and when the uterus greatly enlarges and extends into the abdominal cavity, dragging the bladder with it, even to the level of the umbilicus. When the elevated bladder is partly filled with urine it forms a protruding, fluctuating swelling in front of the tumor.

Downward displacement of the bladder (cystocele) is the most frequent malposition, and is the result of injury to the pelvic floor and of increase in the intra-abdominal pressure. It is most unusual for a cystocele to exist in a nullipara. Occupations which involve much standing and lifting, predispose to cystocele, even in nulliparæ.

In slight degrees of descent the lower part of the bladder is somewhat sunken, and in extreme cases the bladder becomes shaped like an hour-glass, being divided into an upper and lower segment by the urethra. In extreme grades associated with prolapsus uteri, the urethra may run vertically, the external orifice pointing directly upward. Virchow, Philips, Braün, and others have observed dilated ureters and hydronephrosis as the result of obstruction to the flow of urine through the stretched and twisted ureters.

The diagnosis is largely based upon the physical findings; the complaints of the patient will give but little clue to the diagnosis. There is a frequent desire to urinate, and this is associated with more or less pain. Advanced cases may continue with little or no disturbance of the bladder functions. A number of cases of cystocele have been reported in which the passage of the child was impeded. The patient, when she is first aware of the protruding vaginal wall, regards it as "falling of the womb."

With the patient in the lithotomy position, the labia are separated and she is instructed to bear down. The anterior vaginal wall suddenly bulges into a rounded mass, which, if filled with urine, will fluctuate when grasped by the fingers. A metallic sound placed in the bladder will demonstrate the pouching of the bladder into the vaginal tumor.

When a cystocele is observed, the examination is not complete until the position of the uterus, the conditions of the pelvic floor, and the urine are carefully determined, because malpositions of the uterus, injuries to the pelvic floor, and chronic cystitis are almost constantly associated with cystocele.

Treatment.—See Cystocele, page 294.

Eversion of the Bladder.—Eversion of the bladder through a dilated urethra is rarely observed. Before such an event can occur there must be a relaxed bladder wall and a dilated urethra, which, together with an increase in the abdominal pressure, may produce the condition. A sound passed through the urethra will demonstrate the absence of the bladder. Reducing the protruding mass, the bladder is restored to its normal position. This rare displacement has been observed in infants and in the aged more often than in middle age. Pelvic tumors are often associated with the displacement of the bladder, and demand attention after the replacement of the bladder by taxis. Taxis is best performed by placing the patient in the knee-chest position. After replacing the bladder, the patient should be kept in bed for several days, with the hips well elevated. If the urethra is greatly relaxed it may be necessary to narrow its caliber as described on page 846.

Hernia of the Bladder.—Hernia of the bladder through the inguinal or femoral rings and through the foramen ovale has been observed.

3. **Foreign Bodies.**—Winckel divides the foreign bodies found in the bladder into those that originate in the organ itself, those that come from other parts of the body, and those that are introduced from without.

(*a*) **Foreign Bodies Originating in the Bladder** are in large part vesical calculi. Calculi may arise from a precipitation of urinary salts independent of the previous existence of a foreign body, or they may have as nuclei certain foreign elements introduced into the bladder from without or from the upper urinary tract. They are not so common in the female as in the male, because of the shortness of the urethra, the rarity of urethral strictures, and the readiness with which lesions of the female bladder are cured.

In 1792 cases of vesical calculi, found in Moscow by Dr. Klein, only 4 occurred in women. In 10,000 women, examined by Winckel from 1860 to 1884, in only 1 did he find calculi. In 3500 autopsies done upon women in the Dresden City Hospital, stone in the bladder was found 6 times. These statistics speak for the infrequency of vesical calculi in women.

The calculi are usually lodged in the bladder immediately back of the trigone. Not infrequently they lie in the pouch of a cystocele.

In the only case observed by the author a cystocele was filled with about twenty stones, varying in size up to that of a hickorynut. These were found in a woman, aged sixty-five years. A fistulous communication with the vagina had developed in the cystocele, and through it the stones were extracted.

Vesical stones vary in number, size, color, consistency, and composition. They have been known to be as large as a child's head. Hugenberger removed one weighing three and a half pounds. Hundreds of stones may be found in the bladder. They are composed of phosphates, urates, oxalates, and rarely of cystin.

(*b*) **Foreign Bodies in the Bladder that Originate from Other Parts of the Body** are the oxalic and uric acid calculi coming from the kidney,

the contents of ovarian cysts which have ruptured into the bladder (teeth from dermoid cysts have formed the nucleus of stone), the products of extra-uterine pregnancy following rupture of the gestation sac into the bladder, fecal matter from an ulcerated bowel, and finally echinococci may form the nucleus.

(*c*) **Foreign Bodies in the Bladder Introduced from Without** are portions of catheters, sutures, hairpins, pessaries which have ulcerated through the vesicovaginal septum, toothpicks, and the like.

The diagnosis of foreign bodies in the bladder is based upon the patient's complaint of an irritable bladder; later on the clinical evidences of cystitis, and, finally and conclusively, upon the finding of a foreign body within the bladder by palpation and inspection, or upon the spontaneous expulsion of the body.

If the body is large it may be palpated through the vagina. A sound passed into the bladder will often disclose the presence of a foreign body. By inspection of the interior of the bladder, not only the presence of a foreign body is determined, but also the character, number, size, form, and exact location. Direct inspection is of special value when the stone lies in a diverticulum beyond the reach of the sound. Fine gravel, too fine to be detected by the sound, is also demonstrated by the cystoscope. Not only the presence of a foreign body, but the accompanying cystitis is recognized by the aid of the cystoscope. Irritation of the bladder by the foreign body may render the viscus too sensitive for a cystoscopic examination without general anesthesia.

Treatment.—All foreign bodies within the bladder require immediate removal when small; this may be accomplished through the intact urethra, and when too large for this procedure, they are to be removed through a vesicovaginal or suprapubic incision.

To remove a small body through the intact urethra, a speculum is introduced through the dilated urethra. This should be as large as the urethra will accommodate without danger of producing incontinence. Through a reflected light the foreign body is located, and by manipulation the foreign body is made to engage in the speculum when it is withdrawn. Vesical calculi may be crushed by forceps passed through the speculum, and the fragments removed by forceps and irrigation. In applying the lithotrite it is best to partially distend the bladder with water. No attempt should be made to remove large stones through the urethra for fear of producing incontinence. If they cannot be crushed, they are to be removed per vaginam or through a suprapubic incision; the vaginal incision is preferred to the suprapubic.

The vesicovaginal incision is best made with the patient in the Sims position and the anterior wall of the vagina exposed by a Sims speculum. A large sound is introduced into the bladder and made to impinge against the posterior wall of the bladder in the median line. It is then cut down upon from the vaginal side, making an opening large enough to permit the introduction of the index finger, by which the bladder is explored, the foreign body located, and the dimensions noted. The incision is then enlarged with the scissors to a size sufficient to

permit of the extraction of the foreign body. After the removal of the foreign body, the incision is closed with non-absorbable sutures and a permanent catheter is introduced through the urethra. At the end of five or six days the catheter should be removed and in ten to twelve days the patient may be permitted to leave her bed.

In infants particularly, and in all cases in which the vaginal route presents unusual difficulties, also when the stone is of large size, the suprapubic route is preferred.

The bladder is distended with water and a suprapubic median incision is made two to four inches in length, beginning at the upper border of the symphysis and extending upward. Care should be taken to avoid opening into the peritoneal cavity. When the bladder is exposed and grasped with forceps, a vertical incision is made in the median line long enough to permit of the delivery of the foreign body. After the removal of the foreign body the incision in the bladder wall is closed with interrupted chromic catgut sutures and the abdominal wall closed in the usual manner. A self-retaining catheter should be worn for five or six days.

4. **Cystitis.**—Cystitis is an inflammatory lesion of the bladder due to invasion of the walls of the bladder by pathogenic microörganisms.

Etiology.—In 2500 postmortem examinations of women, cystitis was found 68 times (2.7 per cent.).

Virchow holds that the urine must first become ammoniacal, and by its irritating effects cause the epithelium to become loosened before bacteria can gain a lodgement in the bladder wall. Under apparently normal conditions the urine may contain bacteria, hence there must exist a predisposing cause for cystitis before the bacteria manifest their pathogenic properties.

As predisposing causes of cystitis may be mentioned congestion due to overdistention of the bladder; the presence of foreign bodies in the bladder; structures crowding upon the bladder from without (displaced uteri, pelvic exudates, and tumors); traumatisms sustained in labor and surgical operations; the passage of catheters and sounds; ill-fitting pessaries; the irritating influence of internal remedies, of fluids injected into the bladder, and of toxins developed within the body in the course of infectious diseases and intestinal disturbances. Congestion of the bladder from any of the above-named causes will prepare the tissues for invasion by pathogenic microörganisms.

The microörganisms found in the inflamed bladder are the staphylococcus pyogenes aureus, albus, and citreus; streptococcus pyogenes, bacillus coli communis, gonococcus, bacillus tuberculosis, bacillus typhosis, and numerous microörganisms of lesser clinical importance, as, for example, the bacillus aërogenes capsulatus of Welch, diplococcus pyogenes ureæ, coccobacillus, and the urobacillus liquefaciens.

Not infrequently two or more of the above-named bacteria are found in the same case. There is a condition known as *bacteriuria*, in which the urine swarms with bacteria in the absence of any considerable amount of pus or other foreign elements.

The avenues by which these microörganisms enter the bladder are:

(*a*) The *urethra,* which is the most common of all. Microörganisms, which always exist in large numbers in the urethra, vagina, and vulva, may be carried by instruments through the urethra into the bladder. It is possible for bacteria to pass through the urethra into the bladder without the introduction of instruments. This is notably true of the gonococcus.

(*b*) The *kidney,* when infected, may involve the bladder through the medium of the urine. It has been demonstrated that the urine may convey pathogenic microörganisms to the bladder, and there cause an infection without deranging the kidney. The colon bacillus and tubercle bacillus probably most often gain access to the bladder from the blood by way of the kidney.

(*c*) The *bowel,* when adherent to the bladder, may transmit the colon bacillus and other microörganisms to the viscus.

(*d*) *Inflammatory areas* surrounding the bladder, and intimately connected with it, may be the sources of infection, as, for example, pelvic abscesses, suppurating dermoid cysts, pyosalpinx, and perityphlitic abscesses.

(*e*) *Hematogenous* infection of the bladder is not common, though fully demonstrated.

The following summary is from Kelly:

(*a*) Cystitis is always caused by the presence of bacteria.

(*b*) The mere presence of bacteria is not sufficient to cause a cystitis; a further predisposing cause is necessary.

(*c*) There are various modes of entrance for bacteria: through the urethra, through the ureter from the kidney directly, from inflammatory areas in the uterus or Fallopian tubes, and probably from the rectum under similar conditions; still another probable avenue of entrance is through the blood.

(*d*) Under favorable conditions any pathogenic organism may give rise to cystitis.

Anatomical Diagnosis.—With the exception of the tubercle bacillus, the anatomical changes do not differ essentially in the various kinds of infections.

Kelly classifies cystitis as diffuse, circumscribed, and scattered, and calls attention to the important and often overlooked fact that cystitis is not always a disease of the entire mucosa of the bladder, but is more often found in patches with normal mucous membrane intervening. This fact speaks for the efficacy of direct applications to the involved areas, rather than of injections, to the entire surface. Both acute and chronic lesions are recognized.

In the *acute stage* the bloodvessels are prominent, causing a swelling and reddening of the mucosa; small hemorrhages are frequently seen.

In the *chronic stage* the reddening is less intense; the mucosa appears grayish and is thrown into folds. Papillomatous elevations may appear on the surface, and over the surface may be a deposit of pus, degener-

ated epithelium, microörganisms, and salts, forming a false membrane which adheres rather firmly to the mucosa.

In cases of long standing, the muscular wall of the bladder may be involved, being greatly thickened, and giving rise to trabeculæ of muscle bundles intersecting at various angles. Abscesses may develop in the wall, and superficial ulcers are not infrequently seen on the mucosa. The entire mucous membrane may be thrown off in the so-called exfoliative cystitis. (See Plates XXXVII and XXXVIII.)

Clinical Diagnosis.—Frequent, painful urination characterizes cystitis. The voiding of urine affords very little relief in exaggerated cases. The patient may suffer from a constant desire to urinate. The amount of urine voided may be no more than a few drops, and this may be passed every few minutes. It is possible for cystitis with marked changes to exist in the bladder wall without seriously disturbing the functions of the bladder. The temperature and pulse are seldom influenced unless the urethra or kidneys are involved. The bladder is tender to pressure, and an attempt to catheterize or to pass the sound into it causes suffering and should not be done without local or general anesthesia.

The diagnosis is made from a history of the above symptoms, from an examination of the urine, and from direct inspection. The urine is usually alkaline in reaction, though sometimes acid, and contains albumin, pus, bladder epithelium, crystals of triple phosphates, a variety of microörganisms, membranous shreds, and occasionally some blood. When the bacteria are found in pure culture, or vastly predominate over other forms, they are the probable cause of the infection. The presence of the gonococcus or the tubercle bacillus in the urine is conclusive evidence of the true underlying cause.

The clinical distinction between the acute and chronic forms of cystitis is in the duration and intensity of the symptoms. They are dependent upon the same underlying causes.

The *cystoscopic diagnosis of cystitis* is often difficult and may be impossible, but, as a rule, the results are readily obtained and are conclusive. In acute cystitis the difficulty arises from the pain caused by the manipulation of the instrument. Unless the indication is urgent, no cystoscopic examination should be made.

Local anesthesia at the neck of the bladder may suffice. When possible to delay the examination the patient should be confined to her bed, and sitz baths, diluent drinks, and sedatives administered. Chronic cystitis may present equally great difficulties because of the contracted bladder and the deposit upon the bladder wall.

Acute cystitis is recognized through the cystoscope by the prominence of the bloodvessels in the mucosa. This congestion of the mucosa presents a variable shade of red, having an irregular distribution over the surface. The more acute the inflammation the deeper the color. Hemorrhages into the mucous membrane are seen varying in size from a pinhead to a pea, and in color from bright red to almost black. They are most often located near the mouths of the ureters, but may be found at any point in the mucous surface.

Chronic cystitis presents a paler surface of a grayish color; the blood-vessels are faintly traceable; hemorrhagic areas are darker and smaller than in the acute stage. The surface has lost its luster and presents an irregular appearance. The folding and swelling of the mucous membrane may hide the mouths of the ureters, and be so enormous as to suggest the possible presence of a newgrowth.

There may be no secretion, and, again, the secretion may be so abundant and tenacious as to resist all efforts at removal by irrigating. Accumulations of the secretion may be mistaken for newgrowths. Trabeculæ and diverticula are often seen in cystitis, and are largely confined to inflamed areas.

Tuberculous Cystitis.—It is not sufficient to merely diagnosticate cystitis and to distinguish between the acute and the chronic forms, but it is of the greatest importance to recognize, so far as the present methods of examinations will permit, the bacteriological factors involved. This is particularly true of gonorrheal and tuberculous cystitis, since the organisms causing these lesions are well known and we are in possession of the means of detecting them.

Tuberculosis of the bladder is caused by infection through the blood, by extension of a tuberculous process from the kidney, the genital organs, or peritoneum. The lesion is more often found in early and middle life, and is more frequent in the male than in the female. It may be the primary infection in the bladder, or other microörganisms may have previously invaded the bladder. A mixed infection is common. In tuberculosis of the kidney, it is possible for tubercle bacilli to pass through the bladder in the urine for years without infecting the bladder. As in other forms of infection, the healthy, intact mucous membrane resists the invasion of the microörganisms.

The ureteral openings and the trigone are the most common seats of tuberculosis. Grayish tubercles are seen to stud the mucous surface, and are usually found in groups. Later the tubercles coalesce and form cheesy masses, which in turn break down into lenticular ulcers with a flat base and sharp, undermined, ragged borders within which small tubercles are seen. The ulcers may perforate the bladder wall and form fistulous tracts leading to the paravesicular tissue, rectum, and vagina.

The diagnosis is based upon the clinical evidences of cystitis, associated with the presence of tuberculosis elsewhere in the body, particularly in the kidney, upon the bacteriological examination of the urine, the cystoscopic appearance of the bladder, the microscopic examination of excised pieces and scrapings removed from the bladder through the cystoscope or a fistulous opening, and upon inoculation experiments. Unimpaired general health does not exclude the possible presence of tuberculosis. Renal tuberculosis may closely resemble vesical tuberculosis. Only by microscopic examination and inoculation experiments with catheterized specimens of urine is it possible to exclude renal tuberculosis. Careful and repeated examinations may be required.

Prophylaxis.—Prophylaxis is first to be considered in the management of cystitis. Many cases of cystitis can be prevented if due care be taken. In this connection emphasis must be placed upon the necessary precautions to be taken in catheterization.

In the author's experience, about one case in four that is catheterized after operation suffers from painful and frequent urination. Only a small percentage of these cases develop a cystitis, the hyperemia or inflammation being confined to the urethra. The author is far from convinced that all these cases are preventable, but much can be done to limit the frequency of their occurrence.

The following factors in the causation of postoperative cystitis are discussed on page 857: traumatism in pelvic operations, retention of urine, infection from the catheter. Their means of prevention are discussed and will not be again referred to. We may, therefore, pass to a discussion of the active treatment of cystitis.

Treatment of Acute Cystitis.—No operative interference or topical applications are permissible in the acute stage of cystitis. Rest must be enjoined so long as the acute stage continues. Any local interference would tend to aggravate the condition.

The patient keeps to her bed. Hot applications are placed over the hypogastrium, vaginal douches of sterile water are given three or four times daily, at a temperature of 110° F., and continued for fifteen to twenty minutes. The bowels are to be kept freely open, with saline cathartics and rectal injections. The diet should be light and nutritious and free of all stimulants. Pain when excessive should be relieved by opiates; morphine may be given hypodermically, or rectal suppositories of opium may be inserted. Urotropin in 7 grain doses may be given three or four times daily. Much relief is afforded by sitz baths.

Treatment of Chronic Cystitis.—When the acute stage has passed into the subacute or chronic, tentative measures must give way to active general and local treatment.

General Treatment.—General treatment will not in itself suffice for a cure; such treatment is at best supplementary to local applications and to surgical measures. Of the numerous drugs prescribed for chronic cystitis, the author has largely depended upon urotropin in doses of 3 to 7 grains, administered three times daily. It is probable that the best results from internal medication are derived from the drinking of large quantities of pure water. In this manner the bladder is flushed. The author has little regard for the so-called medicinal waters. Salol, in doses of 3 to 5 grains, possesses some virtue in freeing the urine of bacteria and in ameliorating the disagreeable symptoms. The oils of sandal-wood and copaiba, given in capsules containing 5 to 10 minims, are said to give good results in gonorrheal cystitis. To relieve irritation, Kelly recommends zea mays (corn silk), also triticum repens. It is essential to avoid the ingestion of highly spiced foods and alcoholic drinks. If the urine is strongly acid, potassium citrate, carbonate, or acetate may be given; and if alkaline, salol and benzoate of ammonium will correct the condition.

Local Treatment.—(*a*) *Irrigation.*—The washing out of the bladder is a most important adjunct to the other means of treatment, and should be employed when there are large quantities of bacteria, mucus, and pus.

While plain sterile water will mechanically cleanse the bladder in the majority of cases, it is often not so well tolerated as normal salt solution or a combination of normal salt, borax, and boric acid. Kelly recommends these elements in the proportion of 1, 2, and 4 respectively. He lays special emphasis upon the distention of the bladder with such a solution, leaving the bladder moderately distended for a minute or two, and gradually increasing the amount of fluid injected as the patient's tolerance is increased.

Technic of Irrigation.—The patient lies cross-wise of the bed, on a firm mattress, or at the end of a table. Under the buttocks is a drainage pad. The legs are flexed upon the thighs and the knees supported by an assistant. The region about the urethral orifice is thoroughly cleansed by sponging with boric acid solution.

The apparatus required consists of a sterile fountain syringe, with four or more feet of rubber tubing, at the end of which is inserted a sterile glass catheter. In order that no air be allowed to enter the bladder, the irrigating fluid is allowed to escape through the catheter as the catheter is passed into the bladder. The bladder is then filled to the point of beginning discomfort to the patient. The bag or funnel should be held at a level that will favor a slow filling of the bladder. When the patient complains of the bladder becoming uncomfortably full, the flow of solution is checked by pinching the tube. After permitting the bladder to remain distended for a minute or two, the tube is removed from the catheter and the bladder emptied. If the solution does not return clear the process is repeated until it is clear. By patiently pursuing this process day after day it will be found that an increasing amount of fluid can be retained.

If continuous irrigation is desired a two-way catheter may be used to good effect.

(*b*) *Topical Applications.*—A limited quantity of fluid may be injected through the urethra into the bladder. Such solutions are silver nitrate (1 to 2 per cent.), protargol or argyrol (5 to 20 per cent.), bichloride of mercury (1 to 10,000 to 1 to 4000), iodoform emulsion (5 to 10 per cent.).

A syringe with a long nozzle is used by which 2 to 4 grams of solution are injected and permitted to remain in the bladder for five to thirty minutes, depending upon the tolerance of the patient. These injections are repeated two to four times a week over a period of several weeks.

Direct topical applications will be found to be more accurate and satisfactory. This method is applicable to cases in which the lesion is limited in area. The field to be treated is exposed by the cystoscope through which an applicator is directed and the areas involved are directly treated with silver nitrate in the strength of 3 to 5 per cent.

These applications should not be repeated oftener than two or three times a week. They should not be applied to an acutely inflamed surface.

Surgical Measures.—Surgical measures are adopted in severe and persistent cases which do not yield to more conservative measures. This procedure should only be adopted in obstinate and painful cases, for the reason that the patient must endure the disagreeable effects of incontinence of urine for several months.

The operation consists in the formation of a vesicovaginal fistula, and is done for the purpose of establishing free drainage of the bladder in the state of absolute rest.

Technic of Operation.—The patient is placed in the dorsal position, with the thighs well flexed upon the abdomen. The bladder is distended with sterile water and a sound placed within the bladder as a guide. The sound is guided to the base of the bladder well back of the ureteral openings. The anterior wall of the vagina is then exposed by retractors, and with a sharp-pointed knife, a buttonhole is made into the bladder by cutting down upon the end of the sound. The opening into the bladder is made about one inch in length. The mucosa of the bladder is then stitched to the mucosa of the vagina with No. 1 plain catgut, using four interrupted sutures. This will prevent too early closure of the fistula.

A general anesthetic may not be required, though it should be given when not contra-indicated.

After establishing the fistula, a vaginal douche should be taken daily and the external parts protected from the irritating urine by keeping the surface well smeared with zinc oxide ointment. A vulvar pad made of absorbent material must be worn continuously. The author has tried in vain to construct a receptacle for the escaping urine that can be worn by the patient, but has failed.

When the cystitis has cleared up the fistula may be closed in the usual way. (See Vesicovaginal Fistula.)

Treatment of Tuberculous Cystitis.—Tuberculous cystitis demands individual consideration in that the prognosis and treatment present special problems.

Every means that will combat tuberculosis of the lungs must be resorted to in these cases. Fresh air, nutritious diet, and tonics are all valuable adjuncts to the local treatment. If adjacent structures, such as the ureters, kidneys, and Fallopian tubes, are likewise involved, efforts must first be directed to their relief before attempting to eradicate the affection in the bladder.

Topical Applications.—A 5 to 10 per cent. iodoform emulsion may be injected by means of a syringe, and these injections repeated at intervals of two to three days. In a small percentage of cases a cure has been effected, and in a yet greater number some degree of relief has been afforded.

A more effective means of treatment lies in the exposure of the tuberculous ulcers to view by means of the cystoscope and applying

the remedy in concentrated form directly to the lesion. A 20 to 40 per cent. solution of silver nitrate may thus be applied.

More effective than topical applications of caustics is the scraping away of the infection by means of the curet.

Curettage of the Bladder.—Before applying the curet to the bladder, the areas to be curetted are located by a cystoscopic examination. After locating the lesions the bladder is irrigated with a mild antiseptic solution. The curet is then passed through an endoscope into the bladder; the index-finger of the left hand is passed to the anterior wall of the vagina, where it is made to rest as a support to the base of the bladder. The base of the bladder is then lightly scraped. If lesions exist elsewhere the curet is passed over the respective areas, after which the bladder is irrigated with a mildly antiseptic solution.

Excision of isolated tuberculous lesions may be resorted to when other methods have failed. This is done through a suprapubic cystotomy. Through such an incision the affected tissues are readily excised, care being taken to remove only the tuberculous mucosa and to leave all isolated healthy areas from which a new mucosa may be regenerated. If the musculature of the bladder is involved, the entire wall is excised and the edges brought together with catgut sutures. The suprapubic incision is closed and the bladder drained for five or six days through the urethra by means of a self-retaining catheter.

Hyperemia of the Bladder.—Hyperemia, irritable bladder, and neuralgia are terms in common usage, and imply a disturbance of the bladder functions with vascular congestion of the mucosa. This hyperemia may be diffuse, but is more often confined to a definite portion of the bladder, particularly to the trigone. The involved areas are red, swollen, and tender to the touch of an instrument. There is no possible way of distinguishing such a condition from a mild, localized cystitis. The symptoms are identical. Hyperemia of the bladder should be diagnosticated without difficulty by a cystoscopic examination.

5. **New-formations of the Bladder.**—Tumors of the bladder are more rarely found in the female than in the male. Nearly every variety of tumor, both benign and malignant, is found in the bladder. Of the benign tumors there are myoma, fibroma, papilloma, adenoma, and dermoid cysts, and of the malignant tumors, carcinoma and sarcoma.

Fere has shown the places of predilection of tumors in a table constructed from the reports of 107 cases. In the 107 reported cases, 25 were found in the base of the bladder, 17 in the posterior wall, 13 in both the base and walls, 8 close to the left ureter, 5 near the right ureter, 2 in the anterior wall, 1 in the anterior and superior wall; 12 were multiple and 8 diffuse.

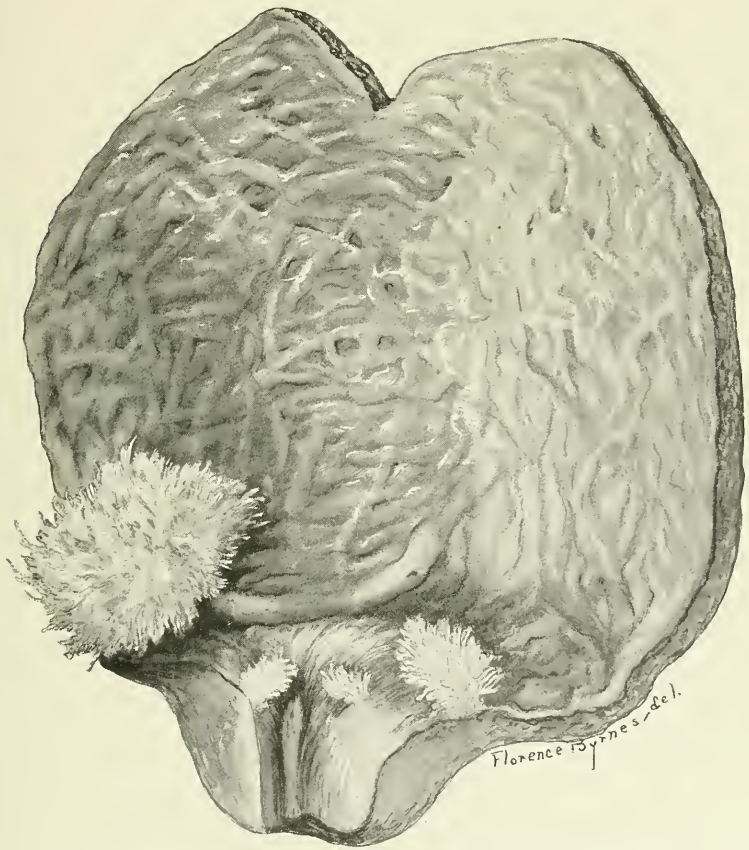
More than half the tumors of the bladder are single.

Myoma.—Myoma originates from the muscular wall of the bladder, and is composed of smooth muscular fiber and a limited amount of connective tissue. The tumor is sessile or pedunculated. But few cases are reported.

Fibroma.—Fibroma usually appears as a fibrous polyp with a long, slender pedicle. The tumor is composed of fibrous tissue. They are rare.

Papilloma.—Papilloma of a benign character protrudes into the cavity of the bladder as a wart-like growth, with villous projections on the surface of the tumor. In the place of villosities there may be nodular projections. They are vascular and bleed freely to the touch. A single tuft may be found on the trigone, or the entire inner surface of the bladder may be covered. Its growth may be slow, extending over years, with but little increase in size. The tumor is rarely as large as a child's fist, and is to be regarded as the most common of the tumors of the bladder.

Fig. 603



Multiple benign papilloma of the bladder. (Watson and Cunningham.)

Adenoma.—Adenoma of the bladder is a rare new-formation of epithelial origin. It is sessile or pedunculated, and seldom attains a large size. The histogenesis of the growth is uncertain.

Dermoid Cysts.—Dermoid cysts of the bladder have been recorded by Paget and Boucher. Their existence has been questioned. Cases are not wanting in which a dermoid cyst of the ovary has discharged its contents into the bladder and there formed a nucleus for vesical calculi.

Carcinoma.—Carcinoma of the bladder is primary or secondary. In secondary carcinoma the primary seat of the lesion is usually in the cervix, having spread thence to the bladder by continuity of tissue.

FIG. 604

Carcinoma of the bladder. (Watson and Cunningham.)

It exists as a vegetating villous growth or as a diffuse infiltration, and is usually multiple. It bleeds freely to the touch and is exceedingly friable. Ulceration quickly follows upon infiltration, and there is a peculiar tendency on the part of the growth to remain localized for a surprisingly long time. Secondary growths are frequently found near the primary lesion.

Sarcoma.—Sarcoma appears in the female bladder more frequently than in the male, and is found at any period of life from childhood to the postclimacteric period. These growths are said to be prone to extend through the urethra and to appear at the vulva.

Diagnosis.—The diagnosis of tumors of the bladder is determined by palpation and inspection. The clinical signs in the early stage are similar, whatever the character of the growth. All tumors show more

or less tendency to bleed. Hemorrhage is the most characteristic symptom. The bleeding is increased during the period of menstrual congestion, and has been observed to be greatest in the night. Pain may be present in the benign as well as in the malignant growths, though seldom to so great a degree, but is singularly absent in many cases. Late in the course of the lesion, emaciation and cachexia develop in cases of malignant growths, and serve to distinguish these from benign new-formations.

Examination of the urine is of little value in distinguishing tumors of the bladder from calculi or cystitis. Evidences of cystitis will usually be found in the urine, but this is not invariably the case even in the presence of large tumors of long standing. On the contrary, the bladder wall may present a normal appearance or may be anemic. The loss of blood may be so great as to produce a high degree of anemia and exhaust the strength of the patient. The presence of cylindrical cells in the urine is regarded by some authorities as conclusive evidence of the existence of a papillary growth.

Palpation reveals the presence of a foreign growth if it is sufficiently large. It may be possible to detect the infiltration of a malignant growth in the neighboring tissues. Two fingers inserted into the vagina and the other hand on the abdomen may engage the tumor. A soft, pedunculated growth may elude detection by this method. Such soft, pedunculated growths and all small tumors can be detected only by a cystoscopic examination. Direct palpation of the tumor through the urethra is an obsolete method.

Direct inspection gives positive evidence of the presence of a tumor, of its size, form, color, and location, of the number of growths, whether pedunculated or sessile, ulcerated or intact; also, as to whether there exists a cystitis and the extent of the inflammatory complications. Through the speculum a piece of the growth may be removed for microscopic examination.

Treatment.—The treatment in all these cases is operative when it is possible to remove the growth.

These cases require careful investigation before deciding upon an operation, because of the frequency with which they are found malignant and beyond the possibility of removal, and the common occurrence of serious complications, such as general debility, nephritis, and cystitis. It is therefore imperative to make a thorough preliminary examination of the urine, to make one or more cystoscopic examinations, and to note the general condition of the patient before deciding upon operative interference.

Having decided to remove the growth, the avenue through which the tumor is to be removed must be chosen. The choice hangs upon the size and number of the growths, the location, and the presence or absence of a pedicle.

The following channels are available: (*a*) The dilated urethra; (*b*) a vaginal incision into the base of the bladder; (*c*) a suprapubic incision; (*d*) by symphyseotomy; (*e*) by cystectomy.

(*a*) *Removal of the Tumor through a Dilated Urethra.*—In order to remove a tumor of the bladder through a dilated urethra, the tumor must be small and pedunculated. The urethra must be dilated to the maximum degree, which in ordinary cases is that of a No. 2 dilator. In order to obtain such a degree of dilatation, it may be necessary to incise the external orifice posteriorly to prevent tearing. A large urethral speculum may then be introduced through which the tumor may be severed from its attachment to the bladder and removed through the urethroscope. A galvanocautery loop is best for the purpose. To sever the pedicle without cauterizing might lead to serious hemorrhage.

Only benign growths are so treated, and hence the necessity of a careful microscopic examination of these tumors after their removal. If found to be malignant, a liberal excision of the bladder wall at the base of the tumor must follow, and this is done either through a suprapubic or vaginal incision.

(*b*) *The tumor may be removed through a vaginal incision* when favorable conditions exist. Tumors of the anterior wall of the bladder are easiest reached through this avenue. The work is greatly facilitated by a lax vaginal outlet.

The tumor is first located by the use of the cystoscope. The patient is best placed in the knee-chest position, though the dorsal position may be employed. A sound is introduced into the bladder, and against the sound the incision is carried in the median line of the anterior vaginal wall. The opening is made sufficiently large to expose the tumor to view. The tumor is grasped by tenaculum forceps and drawn into the incision, and with it the bladder wall at the basal attachment of the growth. The tumor is then excised, and if there is doubt as to the character of the growth, a portion of the bladder wall may be excised, together with the growth. Sutures are then placed to close the wound, and drainage established through the urethra by the insertion of a self-retaining catheter.

Kelly recommends transfixing the bladder wall at a distance from the tumor by one or more sutures to prevent the retraction of the bladder in the act of excision.

(*c*) *Removal of the tumor through a suprapubic incision* is most satisfactory when the tumor is large or multiple and when it is necessary to excise a considerable part of the bladder wall. Through the suprapubic incision the bladder is exposed and opened, if possible, without entering the peritoneal cavity. It is particularly dangerous to enter the peritoneal cavity in the presence of cystitis.

A vertical incision two or three inches in length is made in the median line from the symphysis pubis upward. The vault of the bladder is exposed upon entering the prevesical space by crowding the peritoneum upward. A vertical incision is then made into and through the anterior wall of the bladder. This incision is made long enough to excise and deliver the tumor.

It is well to conserve every portion of healthy mucous membrane even to the smallest islets, in order to facilitate the regeneration of

the mucosa. Whenever possible the defect in the mucosa occasioned by the removal of the tumor should be closed by sutures of catgut. When the tumor involves the musculature of the bladder wall, the entire wall may be sacrificed to a point well beyond the circumference of the tumor. The greater part of the bladder may be removed without destroying its function. Interrupted chromic catgut sutures are used in closing the wound. When the peritoneum has been incised, the rent must be carefully closed with a running suture of plain catgut. The original incision into the bladder is then closed with interrupted sutures of chromic catgut and the incision through the abdominal wall closed in the usual manner. A self-retaining catheter is placed in the urethra for the purpose of free drainage of the bladder; it may be removed at the end of five days.

(*d*) *Symphyseotomy.*—This operation is suggested by Kelly for the removal of tumors at the neck of the bladder. He finds little use for it.

(*e*) *Cystectomy.*—The removal of the entire bladder has been done in advanced malignant growths. It is questionable if the operation is justifiable.

DISEASES OF THE URETERS

Anatomy and Physiology.—**Anatomy.**—The ureters lie behind the abdominal and pelvic peritoneum, and are slightly movable, flattened cords, extending from the kidney to the bladder. Under normal conditions they run symmetrically in an irregular curved course on either side. The average length is ten to twelve inches, the left being slightly longer than the right because of the higher position of the left kidney.

There is no variation in the diameter of the ureter except at either end, where it distends above into the funnel-shaped pelvis and below into the ureteral prominence. The average diameter is 5 mm.

The ureters are traced through the pelvis in a sigmoid course. They lie close to the posterior lateral wall of the pelvis beneath the peritoneum and near the internal iliac artery. From this point they turn forward, passing underneath the uterine artery at the base of the broad ligament, half-way between the cervix and the pelvic wall. They then run parallel to the upper anterior vaginal wall and enter the bladder at the upper angle of the trigone. Through the bladder wall the ureters run obliquely forward and inward.

The course of the abdominal portion of the ureter, including that part running from the kidney to the brim of the pelvis, passes forward in a curved direction over the psoas muscle to the brim of the pelvis. The ovarian veins and artery join the ureter at a midpoint in its course through the abdomen. On the left side it lies behind the colon above and the sigmoid below; on the right side it lies behind the caput coli and the ascending colon.

Physiology.—The ureters are not merely passive in conveying the urine from the kidney to the bladder. A peristaltic wave travels from

above downward two or three times each minute, imparting to the ureters a vermicular movement and forcing the urine onward.

Methods of Examination.—Four methods of examining the ureters are in general use: palpation, inspection, catheterization, and sounding.

Palpation.—It is possible to palpate the pelvic portion of the ureter through the vagina and rectum. The abdominal portion of the ureter cannot be palpated without making an incision into the abdomen or lumbar region.

In palpating the pelvic portion of the ureter, the bladder and rectum must be empty, all clothing constricting the waist must be removed and the patient placed in the lithotomy position.

The index finger is inserted high in the vaginal fornix near the side wall of the pelvis. Stroking the vaginal wall downward and backward, the ureter is felt as a slender cord which slips away from the finger. That portion leading from the base of the broad ligament to the bladder is most easily felt. The size, consistency, mobility, and direction of the ureter serve to identify it in a vaginal examination.

The tendinous arch of the levator ani muscle must not be mistaken for the ureter, nor must the obturator vessels and nerve. Only when the abdominal walls are extremely thin can the ureter be palpated at the pelvic brim, about one and a quarter inches to the right or left of the promontory of the sacrum. When the ureter is diseased the line of tenderness will serve as a guide.

Through the empty rectum, and preferably under anesthesia, the ureter can be traced through the pelvis, the left being more accessible than the right. Guided by the pulsations of the internal iliac artery, and beginning at the bifurcation of the common iliac and tracing downward, the finger detects a flat, yielding cord running downward and forward. The larger and more resisting the ureter, the more easily is it palpated. A catheter or bougie placed within the ureter to serve as a guide will facilitate the outlining of the ureter.

Inspection.—No portion of the ureter can be inspected without an incision except that portion lying in the bladder wall which is recognized through the cystoscope as the ureteral prominence. With the abdomen open, the lower abdominal portion and the upper pelvic portion of the left side may be inspected by drawing the sigmoid toward the median line. It is possible to lay bare the abdominal portion of the ureter by a lateral incision, drawing the ascending or descending colon to the median line. In this way the peritoneal cavity is not opened. The ureter is found lying upon the psoas muscle.

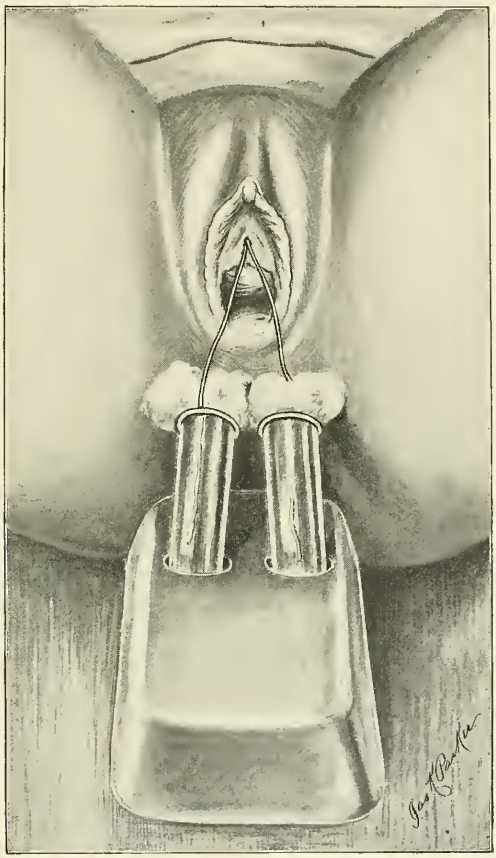
Catheterization.—Both palpation and inspection are of minor importance as means of investigating the ureters. Little can be positively demonstrated by these methods. By the ureteral catheter we may diagnosticate to a certainty the patency of the ureter, the existence of ureteral calculi, foreign growths, strictures, hydroureter, pyoureter, and many of the lesions of the kidney to be considered later.

The urine from either kidney may be collected without mixing with

that of the opposite kidney or with the foreign elements in the bladder and urethra.

By the Nitze method the catheter is introduced through the canal in the instrument. The usual technique of a cystoscopic examination is carried out.

Fig. 605



Simultaneous catheterization of the ureters. The urine may be collected from either kidney in separate sterile tubes and for an indefinite period. The above method is suggested by Kelly.

In the Kelly-Pawlik method and preferably in the elevated lithotomy position, as advised by Webster and Pryor (see Fig. 597), the catheter is directed through an endoscope after a thorough inspection of the bladder. In this method the instruments employed are conical urethral dilators, obturator, specula ranging in size from 8 to 10, head mirror, natural or artificial light, an evacuator, searcher, long, curved mouse-toothed forceps, and a flexible ureteral catheter. For special purposes there may be added hard-rubber bougies, a metal ureteral catheter, and a series of dilating catheters. After thoroughly inspecting the bladder,

as advised by Kelly, the ureteral orifices are located by what is called a searcher. When no difficulty is experienced in locating the ureteral orifice or prominence, the searcher may be dispensed with and the catheter at once directed to the ureter. A metallic searcher is made to lightly impinge against the mucous membrane in the supposed location of the ureteral orifice. No force is to be used for fear of perforating the bladder.

The searcher separates the lips of the orifice, which now presents a dark, rounded opening, and is allowed to drop into the ureter by its own weight. It serves as a guide to the catheter, which is directed to the ureteral orifice. As the catheter enters the ureter the searcher is withdrawn by an assistant.

A flexible catheter has many advantages over one made of metal or non-flexible rubber. It readily follows the course of the ureter to the pelvis of the kidney, and there is little danger of injuring the ureter. When it is desired to catheterize the ureter without entering the pelvis of the kidney, a shorter catheter may be employed, one measuring twelve inches, whereas, it would require a catheter twenty inches in length to extend to the kidney. It is essential that the catheter have a perfectly smooth surface and a blunt, rounded end with an oval eye near the tip. A wire stylet is required to give stiffness to the catheter as it is forced through the ureter.

When the bladder can be inspected without an anesthetic it is usually possible to introduce a catheter without causing great discomfort.

It is important to thoroughly sterilize the catheters both before and after using. All foreign particles must be removed from the lumen of the catheter. This can be done by means of a stylet and by forcibly injecting water through the catheter. They should always be kept straight, for when allowed to roll up the varnish cracks and chips off. When both ureters are to be catheterized, the speculum is withdrawn and reinserted beside the first catheter. When one ureter is catheterized and there is difficulty in passing a catheter into the other ureter, a fairly accurate method of separately collecting the urine is found in completely emptying the bladder, after which a large catheter is placed in the urethra. All urine collected in the bladder while the ureteral catheter is in place is assumed to come from the opposite kidney, and especially is this true when the separate collections differ in character.

When, on account of an infected bladder, it is inadvisable to pass a catheter into the ureter, Kelly advises collecting a few drops of urine directly from the ureteral openings by an instrument which he has constructed for the purpose. This amount will serve for a microscopic examination. When the ureter is tortuous or the caliber is constricted, it may be impossible to introduce a flexible catheter. Heré a metal catheter will be of service, but must be used with caution for fear of injuring the ureter.

Bougies made of hard rubber, two millimeters in diameter and twenty inches in length, are of service in locating ureteral calculi

and in dilating strictures in the pelvic portion of the ureter. It is possible to push the bougies into the pelvis of the kidney without inflicting injury. A bulbous enlargement is placed about seven millimeters back of the point. These bulbs vary in size from a little more than the diameter of the instrument to four millimeters.

Kelly has ingeniously devised a wax tip for the bougies, by which he is enabled to locate calculi in the ureter and pelvis of the kidney. Longitudinal grooves are made on the sides of the tip for the purpose of retaining the dental wax. A silk renal catheter tipped with wax will serve the purpose equally well. The scratch marks made by the calculi are seen under a low magnifying glass. When the *x*-rays fail to detect the stone it may be possible to locate it by wax-tipped bougies.

Kelly gives the following summary in a recent article on "Scratch Marks on the Wax-tipped Catheter in the Diagnosis of Stone in the Kidney or Ureter:"

(*a*) The scratch marks afford a valuable confirmation of the findings of the *x*-ray plates.

(*b*) The wax-tipped catheter serves to distinguish phleboliths about the vault of the vagina and in the pelvic veins from ureteral calculi.

(*c*) In the cases of stout women, in which the *x*-ray findings are unsatisfactory and the repeated use of the *x*-ray is dangerous.

(*d*) In cases of uric acid and uratic calculi, in which the *x*-ray shadow is faint, leaving doubt as to the diagnosis.

(*e*) In extemporized, hurried investigations, when the *x*-ray apparatus is not conveniently accessible, and more especially in retrograde catheterization from the pelvis of the kidney downward in the course of a renal operation, to determine whether there are any calculi lodged in the ureter.

(*f*) In fibrous or old inflammatory thickenings about the renal pelvis which give a shadow on the photographic plate exactly like a stone.

Examination of the Urine Collected from the Ureters.—Following the suggestions of Kelly five things are inquired into in making a thorough examination of the urine collected directly from the ureter and kidney.

1. The amount of fluid escaping at once upon the introduction of the catheter.
2. The rate of flow during catheterization.
3. Physical properties, specific gravity.
4. Chemical properties.
5. Bacteriological condition.

The following points are observed in securing separated urines (Kelly):

1. The exact time of introduction of each catheter is noted.
2. The time of withdrawal is noted and also written on a card, giving the exact duration of the flow.
3. The exact amount of secretion collected in the test-tube is noted.
4. It is well to compare the rate of secretion, determined by noting the amount of flow in a given unit of time, say from five to fifteen minutes or longer, with the entire amount passed in the twelve hours

during which the examination is made. If the amount secured is too small or too large, the error may be rectified in this way. A nervous patient, for example, will sometimes pass an excessive amount through the catheter.

5. An analysis of each specimen of urine is made, investigating its physical, chemical, microscopic, and bacteriological characters. Special attention must be paid to the urea as the most important representative of the physiological activity of the kidney.

Dangers Involved in the Catheterization of the Ureter.—1. Direct injury to the mucous membrane of the ureter and bladder, thereby creating an atrium for infection.

2. Ureteral fever, not unlike urethral fever, caused by the passage of the urethral catheter.

3. Cicatrization of the ureteral opening into the bladder following upon trauma produced by the catheter.

4. Breaking off a piece of the catheter in the ureter.

5. Infection of the ureter and kidneys, possibly leading to a fatal issue.

In view of these dangers the indiscriminate use of the ureteral catheter is to be deprecated. It should be used only as a last resort, and with extreme caution.

Congenital Anomalies in the Development of the Ureters.—

1. Absence of one or both ureters.
2. Occlusion of part or all of the lumen.
3. Double ureter.
4. Ectopic ureteral orifice.
5. Dilatation of a partially occluded ureter.
6. Bending and twisting of the ureter.

1. **Absence of One or Both Ureters** is usually associated with an absence of the corresponding kidney.

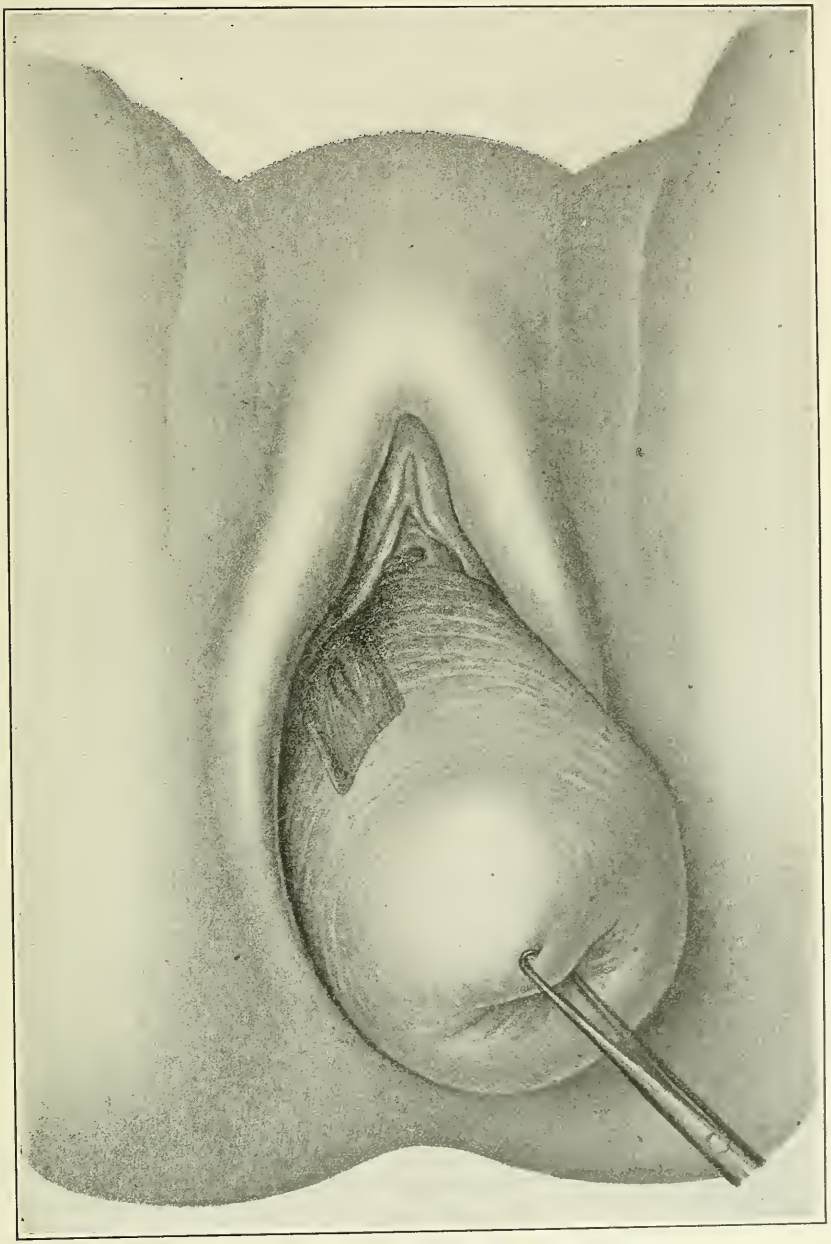
2. **Occlusion of Part or All of the Lumen** of the ureter is associated with atrophy and cystic degeneration of the corresponding kidney.

3. **A Double Ureter**, while not often found, is the commonest of all congenital defects of the ureter. The ureter may be double in any portion of its course or may begin in separate and distinct pelves of the kidney and open separately into the bladder. A double ureter may be unilateral or bilateral. The condition has no clinical significance. The clinical diagnosis is inferred by the discovery of two separate and distinct ureteral openings into the bladder and by the passage of bougies and catheters into each of the ureters.

4. **An Ectopic Ureteral Orifice** presents at a point outside the bladder. Very often this is found in the urethra and vagina. Incontinence of urine is the complaint of the patient. The diagnosis is based upon direct inspection first of the vulva, next of the vagina through a speculum, of the urethra through a urethroscope, and, finally, of the bladder through a cystoscope. The opening will be recognized as ureteral by seeing an intermittent flow of urine pass from it. To determine whether there is a second ureteral opening on the same side, a cystoscopic

examination is made. A catheter or bougie passed into the opening will be directed to the corresponding kidney.

Fig. 606



Prolapse of right ureteral orifice. (Tandler and Halban.)

Treatment.—The operation consists in dissecting the ureteral end from its bed and directing it into the bladder. Another procedure consists in making a suprapubic incision into the bladder and establishing a communication between the bladder and ureter; this is to be followed by ligating the distal end of the ureter and closing the suprapubic incision. Before any operation is attempted it is essential to determine the possible presence of a double ureter. If two ureters are found to emerge from a single pelvis of the kidney and one opens into the bladder, and the other is external to the bladder, all that is required is ligature of the accessory ureter.

5. **Dilatation of a Partially Occluded Ureter** is a rare finding. The corresponding kidney becomes atrophied and cystic unless there is an additional outlet to the urine.

6. **Bending and Twisting of the Ureter** is associated with hydronephrosis, which, in time, may result in complete cystic degeneration of the kidney.

Inflammation of the Ureter.—Ureteritis rarely exists apart from a similar involvement of the bladder or kidney, and is usually secondary to these lesions.

Etiology.—Ureteritis arises from:

1. Extension downward from the kidney.
2. Extension upward from the bladder.
3. Foreign bodies lying within the ureter.

Primary ureteritis is rare and probably only arises as the result of injury by a ureteral catheter or stone.

Secondary ureteritis arises from extension downward from the kidney or upward from the bladder.

Predisposing causes, confined to the pelvis, are cancer and fibroid tumors of the uterus, the pregnant uterus, and pelvic inflammatory lesions originating in the genito-urinary tract.

Morris says that pregnancy may be the starting-point of ureteropyelitis without the development of cystitis.

The streptococcus, staphylococcus, and gonococcus infections almost invariably begin in the urethra or bladder and extend upward to the ureter and kidney.

It is a matter of common observation that an infection may be conveyed from the bladder to the kidney without leaving an evident lesion in the ureters, and it is also observed that the secretions from the infected kidney may continuously bathe the mucosa of the ureters without infecting them, and yet infect the bladder.

Diagnosis.—The *diagnosis of ureteritis* as an independent lesion is seldom made; the clinical picture is usually involved in a cystitis or pyelonephritis. The predominant symptoms are usually those of pyelitis or cystitis.

Pain and tenderness along the course of the ureter are the most characteristic clinical manifestations of ureteritis. Frequent urination, with or without pain in the bladder, is frequently the chief symptom.

It is possible to outline the pelvic portion of the thickened, tender

ureter by a vaginal examination. The fingers introduced to the antero-lateral wall of the vagina will follow the cord as it passes to the vault of the vagina and on to the side of the cervix. It must not be mistaken for a thickened adherent tube or ovary. Through the rectum the ureter may be traced to a higher level.

Tenderness on pressure will serve as a guide to the course of the ureter through the abdomen.

In a cystoscopic examination the ureteral prominence is seen to be injected with bloodvessels radiating from the ureteral orifice. Cloudy and purulent urine may be seen to drip from the orifice into the bladder.

A ureteral catheter will serve to collect the urine from the affected ureter, and this can be compared with the urine from the other ureter.

Tuberculous ureteritis is almost never a primary infection, but is usually secondary to tuberculous pyelonephritis.

We may speak of an ascending tuberculous infection when the ureter is involved secondary to the bladder; of a descending tuberculous infection, when the kidney is primarily infected. The infection may descend on one side and subsequently ascend on the other side.

The walls of the ureter are greatly thickened and the lumen is narrowed from thickening and caseous degeneration of the mucosa. Healing of ulcerated surfaces may result in a cicatricial contraction and obliteration of the lumen; the ureter may be further obstructed by a plug of caseous material. This obstruction leads to hydronephrosis, and, finally, to cystic degeneration of the kidney. A tuberculous pyonephrosis will almost inevitably result from such obstruction.

The *symptoms* are the same as found in ordinary forms of ureteritis, only they are more pronounced.

In advanced cases blood is found in the urine. Pus is invariably present in the urine, and in it tubercle bacilli are occasionally found. A positive clinical diagnosis can only be made by finding the tubercle bacillus in the urine catheterized from the ureters. When found in the presence of a thickened, tender ureter, the diagnosis of tuberculous urethritis is established.

The smegma bacillus closely simulates the tubercle bacillus in its size, form, and staining qualities. It is found in the secretions of the external genitals, and is not to be confounded with the tubercle bacillus. In a catheterized specimen no smegma bacilli will be found.

Inoculation experiments may be carried out on guinea-pigs and rabbits, with promising results. Injections with tuberculin as a diagnostic measure have been made, and with positive results.

The finding of tuberculosis in the bladder or kidney, associated with an irregularly thickened tender cord, should establish the diagnosis of tuberculous ureteritis to a high degree of probability.

Treatment.—During the acute stage of ureteritis the treatment must be purely expectant. It consists of rest in bed, ice-bags over the affected parts, the management of associated lesions in the kidney and bladder, and relief from pain by analgesics, if demanded.

In the chronic stage of ureteritis the treatment must be directed not alone to the ureter but to the kidney and bladder as well if these organs are infected.

When there is not a complete obstruction to the passage of the urine through the ureter, as ascertained by the passage of a catheter, much may be done to clear up the infection by washing out the pelvis of the kidney and ureter through a ureteral catheter. For this purpose a 1 to 10,000 to 1 to 40,000 solution of bichloride of mercury may be used two to three times a week. In addition to this, urotropin in 7 grain doses, repeated three times daily, may be administered.

When stricture or complete occlusion of the ureter follows the treatment becomes surgical. (See page 883.)

Tuberculous Ureteritis.—The treatment of tuberculous ureteritis may be tentative or radical, depending upon the extent of the involvement and the degree of disturbances created with particular reference to the general condition of the patient.

If there is great depression surgery cannot be invoked, but we may be guided by the rule that the lesion demands surgical intervention if the general condition of the patient will permit and if the disease is not so widespread as to be unmanageable.

Removal of the affected kidney and ureter is the only possible treatment that will promise permanent results, but before resorting to such radical measures, it must be known with certainty that the opposite kidney and ureter are not likewise involved.

To remove the kidney and ureter the extraperitoneal route should be chosen. Kelly makes a long incision in the loin in front of the quadratus muscle, half-way between the ribs and ilium, and continues in an oblique direction downward and forward, skirting the anterior superior spine within 4 cm. ($1\frac{1}{2}$ inches) of it, and ending in the semilunar line over the top of the broad ligament. He then divides the skin, fat, muscles, and fascia down to the peritoneum, which he dissects up by the fingers. He locates the ureter by raising the colon. If not readily seen, he traces it from the pelvis of the kidney downward. The peritoneum need not be opened at any point. After freeing the kidney by ligating its vessels and detaching the abdominal portion of the ureter, he frees the pelvic portion by following the upper portion as a guide, while the fingers lift the pelvic peritoneum from the vessels which drop with the ureter over the brim. By pulling it out, the ureter is freed down to the floor of the pelvis and forward. To complete the enucleation as far as the vesical attachment, the uterine artery and veins are tied and divided.

Obstruction of the Ureter.—The ureter is more frequently obstructed in women than in men, owing to the pressure exerted upon the ureter by swellings of the uterus, tubes, and ovaries.

Causes.—The following classification is made by Kelly:

First, *causes acting from without and occluding the ureter by pressing upon it,* such as:

1. Ovarian tumors.
2. Uterine tumors.
3. Cancerous infiltration of the broad ligaments.
4. Cancer of the cecum.
5. Retroperitoneal pelvic sarcoma.
6. Aneurysm of the iliac artery.
7. Scar tissue in the broad ligament.
8. Perineuritis.
9. An omental adhesion to the pelvic brim.
10. Thickened bladder walls.
11. Sarcoma of the bladder.
12. Pedunculated tumor of the bladder.

Second, *foreign bodies lodged in the ureteral canal:*

1. Calculus.
2. Blood clot.
3. Echinococcus cyst.

Third, *affections of the ureteral walls themselves:*

1. Ureteritis bacillus coli communis.
2. Ureteritis gonorrheica.
3. Ureteritis tuberculosa.
4. Valve formation in the ureteral wall.
5. Gumma in the wall.
6. Cancer of the ureter.
7. Psorospermial cysts.

The point of obstruction is most frequent in the pelvic portion of the ureter. Here the ureter is often engaged between the unyielding bony wall of the pelvis and various tumors and inflammatory swellings within the pelvis. One or both ureters may be involved.

Diagnosis.—The diagnosis involves not only the fact of obstruction to the ureter, but the determination of the cause of the obstruction, its location, the rapidity with which it has developed, and the extent of the obstruction.

The clinical manifestations are variable and unreliable. Pain in the region of the kidney and ureter is the most constant symptom, yet a moderate degree of obstruction may exist without causing symptoms. The more rapidly the obstruction develops, the greater are the clinical disturbances.

Frequent painful urination suggests an inflammatory obstruction or a calculus. Symptoms are particularly unreliable as a guide to the diagnosis in a slowly developing obstruction. When the ureter has been suddenly plugged with a calculus or blood-clot, the intensity and location of the pain are so characteristic as to frequently serve for a diagnosis.

In making a diagnosis of obstruction of the ureter, all causes above enumerated are to be sought for. All swellings of the pelvis are to be outlined in a bimanual examination. When there is frequent painful urination and the cause of the disorder cannot be located in the ureter or bladder, it becomes imperative to explore the ureters by bougies

and catheter. An inflammatory swelling of the ureter palpated through the vaginal wall suggests a probable cause for the obstruction, but does not eliminate the possible existence of other causes.

Fig. 607

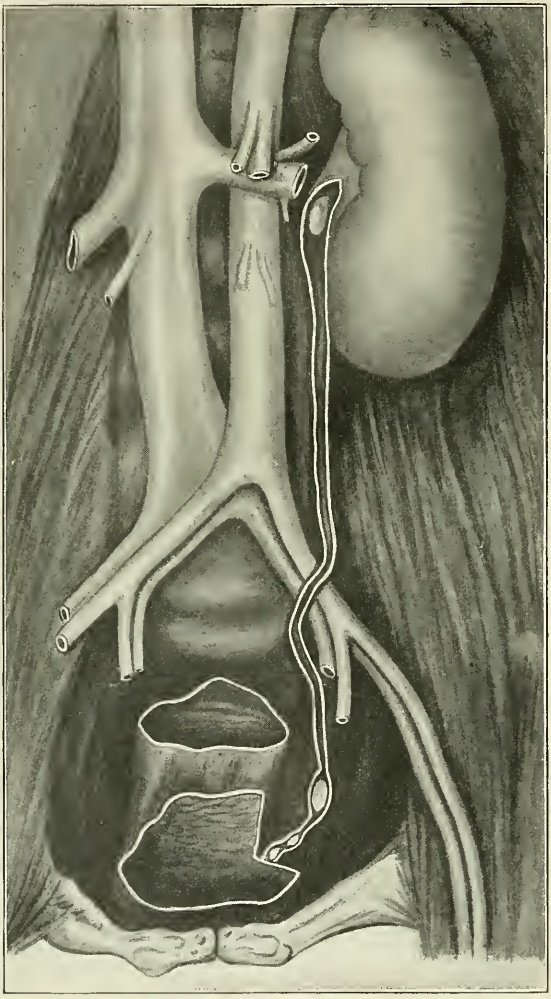


Diagram of course of ureter, showing the usual locations of ureteral calculi.

The only positive means of locating an obstruction in the ureter is by the passage of a bougie or catheter. The instrument will meet with an obstruction at a point below the pelvis of the kidney, or after passing a given point with some resistance, the constricted portion grasps the instrument so as to resist its withdrawal. Occasionally when passing a ureteral catheter no special resistance will be noticed until

there appears a sudden discharge of an unusual amount of fluid which has accumulated behind the obstruction.

Ureteral Calculus.—Calculi may lodge at any point in the course of the ureter, but are most often found near the pelvis of the kidney, the floor of the pelvis, and the flexure at the pelvic brim. These calculi are elongated and cone-shaped. They are of rare occurrence.

Diagnosis.—A probable diagnosis is based upon the periodic recurrence of a colicky pain radiating from the kidney along the course of the ureter. Following these attacks of pain there may be a rise of temperature and the appearance of blood in the urine. The *x*-rays will often locate the stone with accuracy, and should be used in all suspected cases.

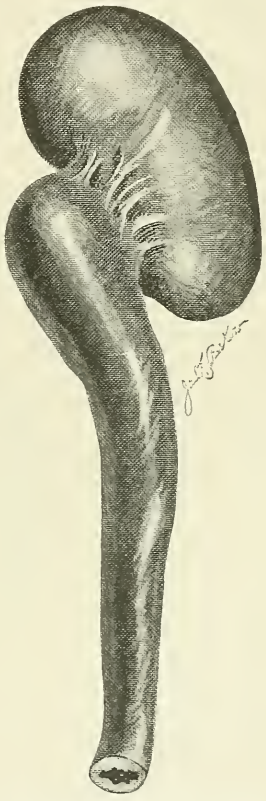
The symptoms are the same as those of renal calculi.

The passage of a calculus along the ureter is suspected when pain, tenderness, and hematuria have persisted for several days and the tenderness is found to descend along the course of the ureter from time to time, and is finally located in the bladder.

Occasionally the stone will act as a ball-valve in plugging the ureteral opening of the pelvis of the kidney. In such an event there will be a temporary hydronephrosis with intermittent discharge of the contents through the ureter. Under favorable conditions a stone may be palpated through the vaginal wall, rectum, or abdominal wall. In rare instances a stone has been seen through a cystoscope to project from the ureter into the bladder.

When the stone lies higher up in the ureter, it is detected with absolute certainty by passing a catheter or sound. The device practised by Howard Kelly of tipping the catheter or sound with wax is of special service in these cases.

Fig. 608



Hydroureter and hydronephrosis. The ureter and pelvis of the kidney are distended with urine. The obstruction was due to adhesions in the pelvis.

Palliative Treatment.—Pain can best be controlled by hypodermic injections of morphine. Hot fomentations over the seat of pain may aid in affording relief. If the pain is checked the case may be treated expectantly in the hope that the stone may pass into the bladder.

Operative Treatment.—The onset of distention of the kidney and ureter is the signal for immediate operative interference.

Before proceeding with the operation it is necessary to locate the stone. This may be done with the *x*-ray in a large proportion of cases.

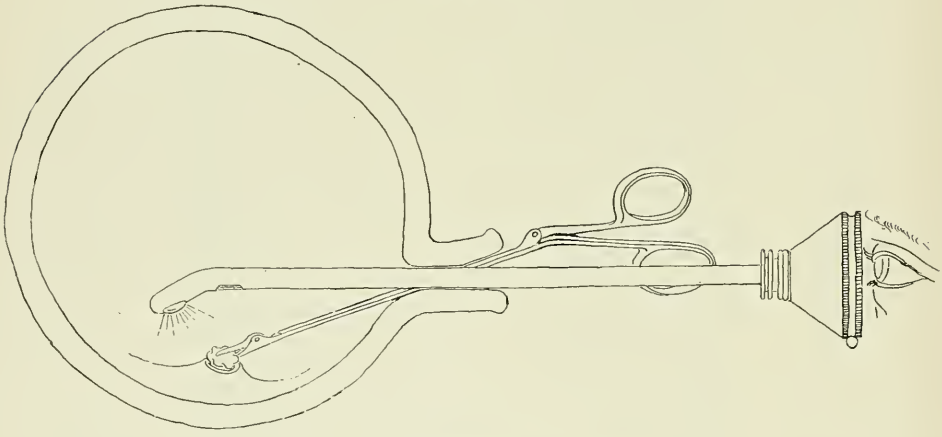
A more accurate demonstration is made with the ureteral catheter, by which the exact position of the stone is demonstrated at the point of obstruction to the passage of the catheter.

The extraperitoneal route is preferred in all cases; this is the imperative choice when the ureter is infected.

When the stone lies near the pelvis of the kidney an incision is made in the lumbar region, and through this incision the upper segment of the ureter is exposed and the stone palpated. A longitudinal incision is made down upon the stone, taking care to avoid the vessels and all unnecessary injury to the ureter. The stone is extracted and the incision closed with interrupted sutures of silk or linen.

When the stone lies at a lower level, and yet above the brim of the pelvis, the usual incision for the appendix may be made down to the peritoneum. The operator then dissects the peritoneum from the abdominal wall, carrying with it the cecum, and thereby exposing the ureter with its contained stone. The incision into the ureter, the removal of the stone, and the closure of the wound are made as in the removal of the stone through the lumbar incision.

Fig. 609



Removal of ureteral calculus. (Gellhorn.)

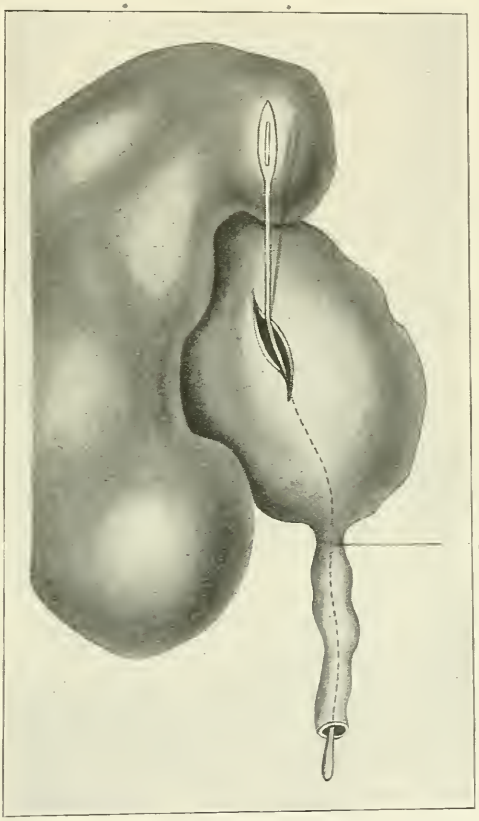
Stone located near the bladder can best be reached through an incision made in the linea semilunaris down to the peritoneum. Then by dissecting the peritoneum from the pelvic wall the stone is reached and removed in the manner described above.

In selected cases it is possible to remove a stone from the lower end of the ureter by an incision made through the vaginal wall. Through this incision the stone is extracted and the wound in the ureter closed with sutures. If there is any doubt as to the permanency of the closure, the incision through the wall of the vagina may be left open for drainage.

When the stone presents at the ureteral opening into the bladder it is possible to enlarge the opening by scissors passed through a urethroscope and then to extract the stone with forceps.

Removal of Ureteral Calculi under the Guidance of the Cystoscope.—Gellhorn describes a method of removing ureteral calculi, in which he distends the bladder with sterile water, introduces a cystoscope, and upon exposing the ureteral orifice, he inserts a slender alligator forceps, such as are used in removing foreign bodies from the larynx.

Fig. 610



Ureteral stricture causing distention of pelvis and slight hydronephrosis. *a*, point of stricture.

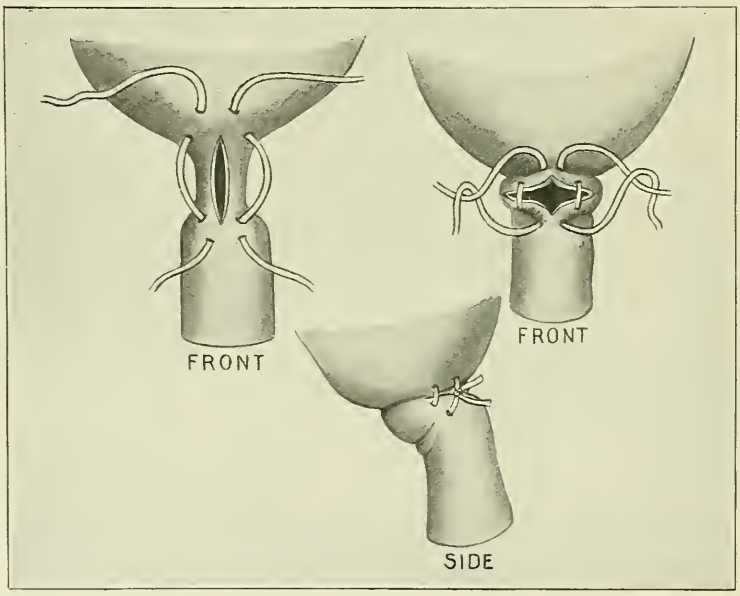
Stricture of the Ureter.—Direct violence is seldom the cause of stricture of the ureter, because of its deep-seated position. The passage of a stone may result in a stricture, as may also long-standing inflammatory lesions in and about the ureter. A few are congenital in origin.

The urine may be voided frequently, and with pain. There are no findings in the urine to suggest the diagnosis. Tenderness in the

flanks is a common complaint. There may also be pain in the bladder. When the stricture is within or below the broad ligament it may sometimes be palpated through the vagina as a firm cord.

Hydroureter and Hydronephrosis develop when the passage of the urine is obstructed. Pyoureter and pyonephrosis may develop secondary to an obstruction in the ureter, and are dependent upon a pyogenic infection. These conditions are diagnosticated by the passage of a catheter beyond the point of obstruction and the emptying of the accumulated fluid. Abdominal palpation may detect a cystic swelling. Continuous pain or intermittent colic in the region of the kidney and ureter are highly suggestive of the condition, though no positive diagnosis can be made without an exploratory puncture through an incision in the back or catheterization of the ureter.

Fig. 611



The mode of applying the sutures after division of a ureteral stricture of a valve.

Treatment.—The stricture may be dilated when resident in the pelvis, provided it is possible to pass a bougie through the constriction, and provided the stricture is benign and yielding. Great perseverance may be demanded in making repeated attempts to pass the bougie and in progressing from the smaller to the larger sizes of bougies.

If an infected ureter lies above the point of constriction a cure may be effected by irrigating the pelvis of the kidney and ureter with a bichloride of mercury solution, 1 to 100,000 to 1 to 40,000, and repeating

the process daily until the urine is free of pus. Such fortunate results, however, are seldom obtained by so conservative a method.

When atrophic changes have taken place in the kidney no good can come from the painstaking task of dilating the ureter.

Traumatic strictures of the ureter are of rare occurrence. The location most favorable for treatment of these strictures is at either end of the ureter. They may be divided longitudinally and sutured in the opposite direction, so that the opening through the ureter is greatly enlarged. This would not be a difficult matter at the upper end of the ureter.

CHAPTER XXXIII

POSTOPERATIVE TREATMENT

Responsibility for Complications
Stimulation
Position of Patient
Relief from Pain
Nourishment
Evacuation of Bladder
Care of the Bowels
Application of Ice to Abdomen
Duration of Convalescence
Early Rising

RESPONSIBILITY FOR COMPLICATIONS ARISING AFTER OPERATIONS

It may be said, without fear of contradiction, that the complications arising after operation are largely preventable, and that the responsibility for such complications rests in large measure with the attending surgeon.

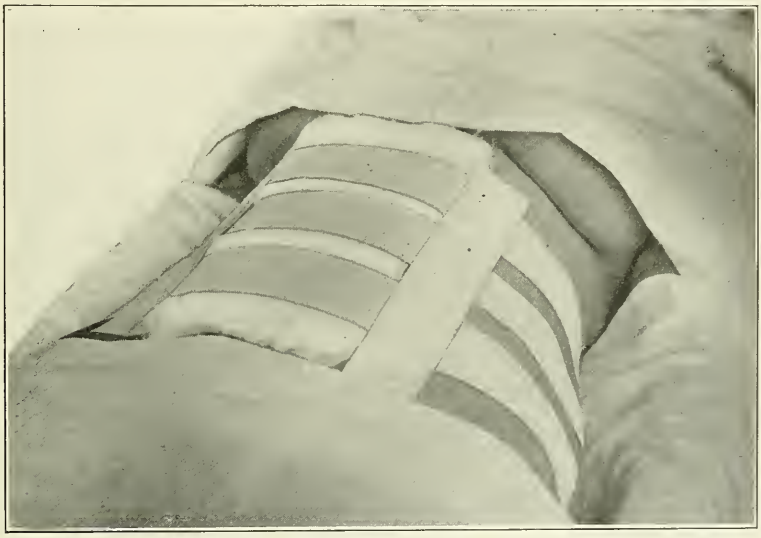
Shock follows an operation, and it is observed that an operation of election has been performed in the presence of grave anemia or of an incompetent heart; pneumonia develops after an operation, and it is ascertained that at the time of the operation the patient was suffering from a bronchitis or that there was an unnecessary exposure to draught in the operating room or after the operation; there is profound shock following the operation, and the operator is known to have unnecessarily exposed and handled the viscera, or the anesthetic was given in too large quantities. Localized foci of infection or general peritonitis result from lax methods in technic or untimely surgical intervention in cases of acute pelvic infection. These and many other examples may be cited in support of the statement that the surgeon is not infrequently responsible for the complications arising after operation.

There is a certain degree of discomfort associated with every convalescence from a surgical operation. Experience is required to alleviate these discomfitures, and when they become exaggerated the responsibilities of the surgeon may be made even greater than in the performance of an operation. *Indeed, it may be contended that the services of a skilled and experienced surgeon are as indispensable in the after-treatment as in the operation, and hence it follows that the surgeon who relegates the after-treatment to assistants of limited experience falls short of fulfilling his obligations to his patients.*

As soon as an operation is complete and the stitches removed, the gynecologist frequently regards his services at an end. He volunteers some words of advice as to the amount and character of the exercise, the food and rest his patient should take, his assistant records the

patient as recovered on the history sheet, and the transaction is closed, unless again opened up by further appeals from the patient. Is this the proper attitude for the surgeon to assume? Decidedly not. With added experience the author attaches more and more importance to postoperative treatment. He is impressed with the necessity of administering postoperative, general, and local treatments, which tend to restore the integrity of the organs, and of regulating and strengthening the general system, so that not one but all of the organs and functions of the body are brought into general harmony. The gynecologist who is the most successful and reliable is the one who places a just estimate on medicine and surgery and employs them without predilection and prejudice.

FIG. 612



Abdominal pad applied after laparotomy.

After operation we frequently find our patient nervous; she is neurasthenic, melancholic, or hysterical. Shall we dismiss such a patient and turn her over to the harassing influences of her friends and to the nerve-racking cares of the household? To do so is to commit her to permanent invalidism. She needs sympathy, encouragement, and education, in order that her disordered mentality shall be restored to its proper balance. She is frequently poorly nourished and her muscular development is weak; it is not sufficient to give her general instructions, but rather should she be under constant direction in her diet and exercise. The bowels and kidneys fail to perform their functions, and must be regulated not alone through the three or four weeks of convalescence, but for all time. We have curetted a subinvoluted or metritic uterus, but it remains enlarged and congested if not followed

persistently by vaginal douches and tampons. We have broken up numerous adhesions which may re-form if the douches and tampons are neglected. We have replaced the uterus by ventrosuspension or shortening of ligaments, and without the wearing of a pessary, for two or more months, the chances of recurrence are increased. These and many other instances may be cited to emphasize the importance of postoperative treatment.

A consideration of the postoperative management of cases will be of interest.

FIG. 613

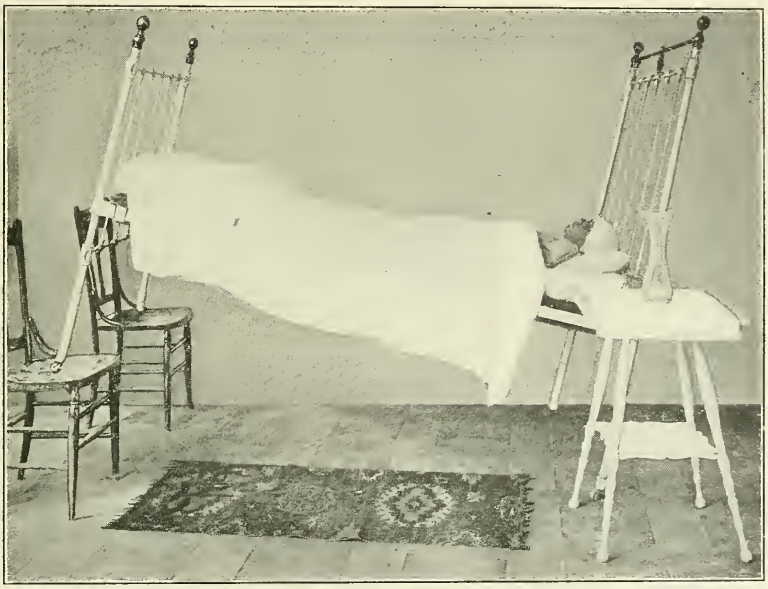
Elevation of the head of the bed.

1. **Stimulation.**—Stimulation during and after the operation may become imperative. The author usually orders a rectal injection of a pint of salt solution and two ounces of whisky immediately after the patient is returned to her bed after all major operations, when there is the least depression. When the pulse is weak and rapid these injections may be repeated every four to six hours, and if deemed necessary they may be substituted or reënforced by subcutaneous injections of normal salt solution, given preferably in the breasts. Hypodermic injections of strychnine sulphate, grain $\frac{1}{60}$ to $\frac{1}{20}$, may be given at intervals of two to six hours. Judgment must be exercised in the employment of these stimulants; one's anxiety may lead him into the error of over-

stimulation. When there is nervousness, strychnine should be given sparingly.

2. **Position of Patient.**—The position the patient is made to assume in bed varies with the conditions found after operation. Raising the foot of the bed twelve to twenty inches will greatly favor a weakened heart action. On the contrary such a position has serious objections in that the diaphragm is encroached upon and its excursions embarrassed by the abdominal contents. Bearing this in mind the author has frequently raised the head and trunk on pillows to an angle of 45 degrees. The effect is to cause the abdominal contents to fall away from the diaphragm, thereby favoring deep respirations, and this in turn favors

Fig. 614



Elevation of the foot of the bed.

the heart action. Furthermore, it is observed that this position materially lessens the distressing nausea and vomiting and favors the expulsion of gas and the evacuation of the bladder. When the pelvis has been contaminated, as in the rupture of a pus-tube, this position will, in a measure, prevent the spread of the infection to the abdomen. The question is often asked, "How soon after the operation can the patient turn on her side?" It is a source of relief for the patient to turn from the back to the side, and there is seldom any objection to permitting her to do so from the onset, and to remain lying on the side with the back supported by pillows.

The nurse or doctor must be in constant attendance at the bedside until the patient has regained consciousness. Care must be taken

that the patient does not burn herself with hot-water bottles when unconsciously moving about in the bed, and that the throat be kept free of mucus and vomitus.

3. **Relief from Pain.**—Relief from pain often becomes imperative. Some operators proscribe all opiates after operation, on the theory that they lock up the secretions. It is my opinion that this objection is more than counterbalanced by the relief from pain, affording the patient much needed rest after the strain of the operation. The author is in the habit of giving $\frac{1}{2}$ grain of codeine or $\frac{1}{12}$ grain of heroin hypodermically, and repeating it in two or four hours if necessary. Occasionally the pain is so intense that nothing short of morphine will bring relief.

Fig. 615

Fowler position.

Much of the pain in the abdomen is caused by gaseous distention of the bowel, which is best relieved by the rectal tube passed high into the bowel and by enemata. An ounce of powdered alum dissolved in a pint of warm water injected into the bowel will often give quick relief; or equal parts of warm milk and molasses will be found effective. The author has had gratifying results by giving a hypodermic of eserine, grain $\frac{1}{40}$, twenty minutes before giving the enema. The eserine materially aids in the expulsion of gas. As stated above, gas pains will be materially lessened by raising the patient in a semisitting posture. Hot fomentations and turpentine stupes are effective in relieving gas pains. Before applying them the dressing over the wound should be protected by a covering of oiled silk.

4. **Nourishment.**—The nourishment in the postoperative stage is a subject which cannot be disposed of by formulating definite rules. No nourishment can be retained in the stomach, as a rule, in the twenty-four hours immediately following operation. Hot water may be sipped at intervals, and within a few hours cool water may be given *ad libitum*, provided it is retained. Large quantities of cold water seem to engender gas pains, and should be avoided.

Champagne in cracked ice is often most gratifying at this time, or a less expensive substitute, seltzer water or beer, may be given. Broth, soups, and milk can usually be borne at the end of twenty-four hours, and a light but nutritious diet can usually be begun on the third day.

FIG. 616

Catheterizing the bladder. Nurse holding the labia apart while passing the catheter.

If milk is not well borne it is well to add seltzer water, lime water, or Apollinaris. If nausea persists so that no food can be retained after the first twenty-four hours a nutrient enema should be given to maintain the strength. This enema may consist of 60 c.c. of milk, 30 c.c. of cream, the yolk of two eggs, and two drams of whisky or brandy. (See Chapter XIII.) Before resorting to nutrient enemata the stomach should be washed out and the stomach feeding again tried.

5. **Emptying of the Bladder.**—After operating upon the vulva and vagina there is often much difficulty experienced in voiding the urine.

The danger of infecting the urethra and bladder by means of the catheter is great, and hence the patient must be encouraged to void the urine. A satisfactory procedure has been suggested by Dr. J. B. Murphy. It consists in injecting into the anterior segment of the urethra two drops of spirits of camphor. A medicine dropper may be employed for this purpose. The effect is to produce a peculiar sensation, which impels the patient to urinate within a few minutes. There is little or no discomfort unless the injection comes in contact with the vulvar surface, when it will cause smarting and burning. The employment of this method has obviated the necessity of using the catheter in nearly all cases.

Fig. 617

Propping patient on side with pillows.

When necessary to use the catheter the utmost care must be exercised. The glass catheter is preferred to rubber; it must be boiled before using, or boiled and kept in a 5 per cent. carbolic acid solution until used, and is rinsed in sterile water before inserting into the urethra. In unskilled hands the rubber catheter is the safer, and this can best be sterilized by boiling before using.

Catheterization is a surgical procedure and must be performed in compliance with the principles of surgical cleanliness. The catheter should never be passed under a sheet, but a good light should be provided and

the vulva exposed so as to bring the urethral orifice into view upon separating the labia with the forefinger and thumb of the left hand. A boric acid solution may be used to sponge off the urethral orifice and the neighboring structures. Then the catheter is inserted, taking care not to force it, but rather to let it find its way into the bladder, merely directing its course. On removing the catheter place the end of the index-finger over the outlet of the catheter so that its contents will not escape upon the vulva. Great care should be taken in passing the catheter to avoid touching the catheter to the labia, for in so doing infection may be carried to the urethra. A large proportion of cases of cystitis are caused in this manner.

FIG. 618

Elevating the knee by pillows to relax the abdominal wall.

6. **Care of the Bowels after Operation.**—Unless it is imperative that the bowels should be locked for a given time, catharsis may be inaugurated twenty-four hours after operation. The author's custom is not to disturb the bowels until the morning of the fourth day of the operation. In so doing a residue accumulates in the bowel, so that a cathartic or enema calls forth a ready response from the bowel, and without the griping pains so commonly experienced from early catharsis.

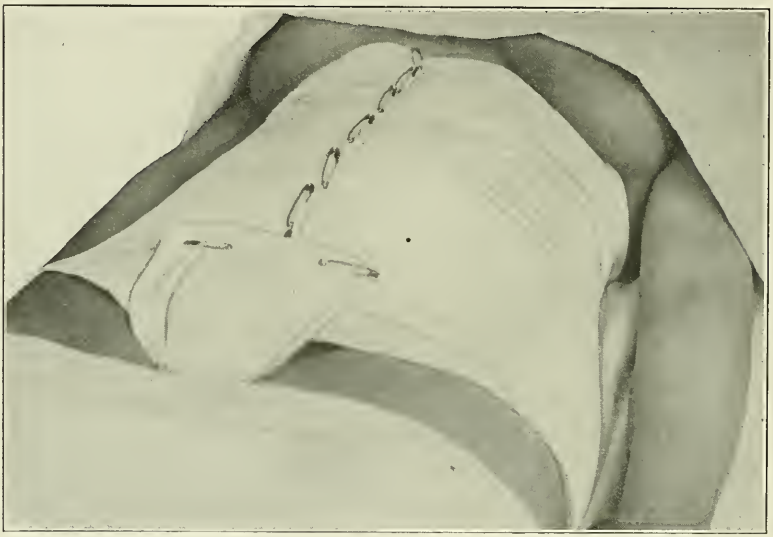
The author usually orders a grain each of calomel and soda, to be repeated in two hours. Four hours later a half-ounce of Epsom salts is given, and if this does not give the desired results an enema is given, consisting of Epsom salts 2 ounces, glycerin 2 ounces, and water 4 ounces. Thereafter a half-ounce of compound glycyrrhiza powder may be given from day to day. Enemata may be injected as required. The author is prejudiced against the rule of giving cathartics in the evening, because the sleep is unnecessarily disturbed.

7. **Ice Applications to the Abdomen.**—Simpson, of Pittsburg, recommends the application of ice-bags to the abdomen, both as a prophylactic and as a curative measure in pelvic and general peritonitis. He bases his opinion on extensive clinical and experimental observations. One to five ice-bags are placed close to the surface of the abdomen. He extols the practice for the relief of pain and the prevention of

peritonitis, and believes it to be a life-saving agent in not a few of the grave cases of general and localized peritonitis. He does not, however, recommend it to the exclusion of other well-recognized medical and surgical measures.

8. **Duration of Convalescence.**—The duration of the convalescence is naturally a variable quantity. For an ordinary curettage and repair of the cervix, five to seven days in bed will usually suffice. After perineorrhaphy the patient should be confined to her bed twelve to sixteen days. Following abdominal sections the average time in bed is ten to twelve days. If abdominal drainage has been established, if infection of the stitches occurs, if the general condition does not permit, this time must be extended for days and possibly for several weeks.

Fig. 619



Combination abdominal binder and vulvar dressing worn after operation.

For years the author followed the above rules in permitting his patients to sit up and walk about after operations, but of late years he has encouraged early rising in a large proportion of his cases. For the ordinary abdominal operations he does not confine his patients in bed for more than three to five days. On the third, fourth, or fifth day they are allowed to sit in an easy chair, with legs extended on a stool. The first day they are permitted to sit up perhaps a half-hour, the second day one or two hours, and from then on they are generally able to sit up and walk about at liberty.

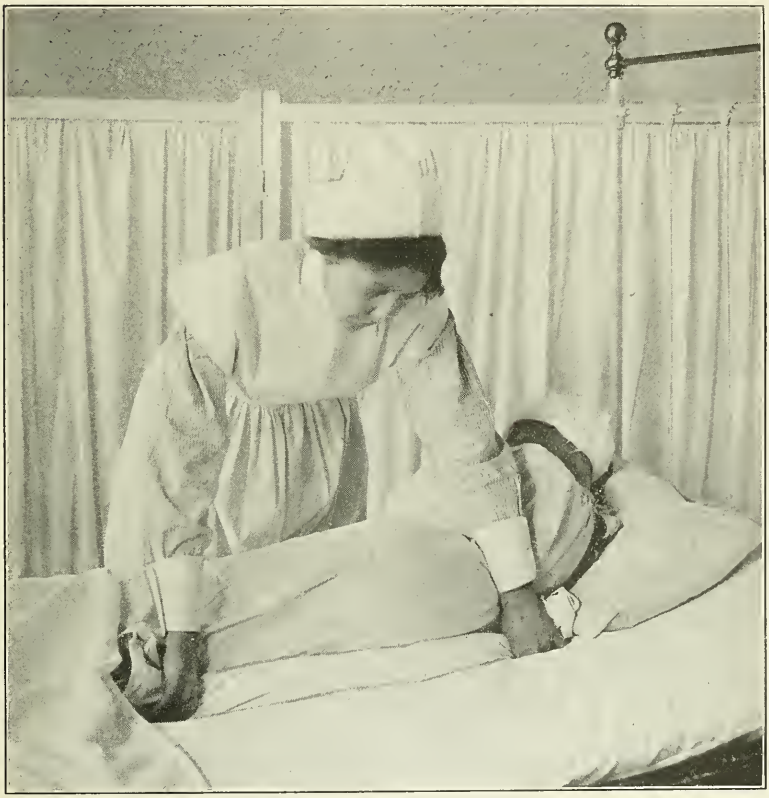
The advantages of early rising after operation are:

1. Encouragement to the patient.
2. Better control over the bladder, bowels, and stomach.
3. Avoidance of the weakening influences of the supine position.

4. A more speedy restoration to health. Each case is a law unto itself in this regard, but as a general proposition the author is in favor of early rising after operation.

It must be borne in mind that convalescence does not end with the removal of the stitches and the relief from pain and discomfort; time must be allowed for restoring the general strength and building up the nervous system. This may require many weeks and months, during which time the patient must be judiciously guided in her manner

FIG. 620



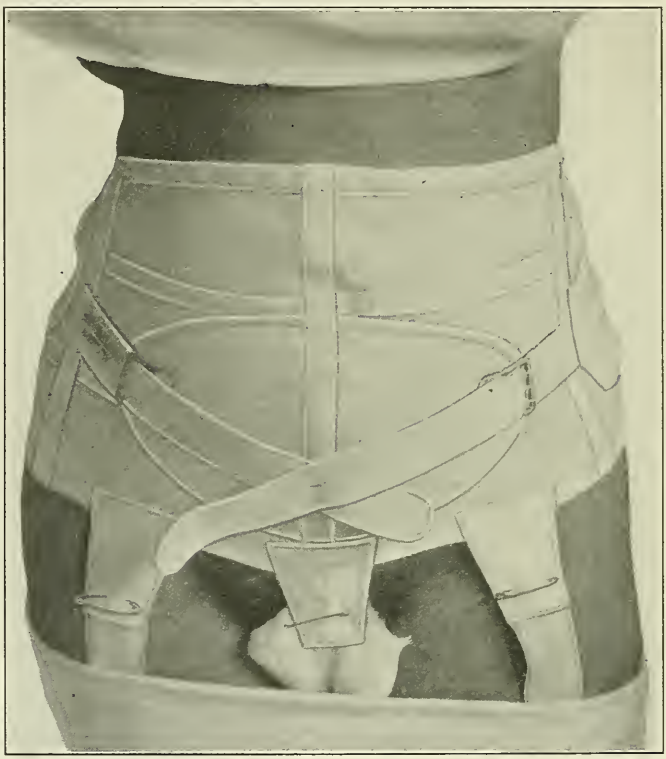
Changing draw sheet under patient.

of living, with particular regard to diet, exercise, baths, and rest. Daily walks and drives are of special value, and to this end a climate should be sought in which daily exercise can be taken in the open air, and where the environment is agreeable and entertaining.

There should be no social or domestic cares to cause fatigue or anxiety. Food should be selected in view of obtaining the maximum amount of nourishment. When the blood is low, tonics, such as iron, strychnine, and arsenic, may be given with beneficial results.

Abdominal Supporter.—It is well to provide a suitable abdominal support to be worn after all abdominal operations. This is particularly true of cases in which there is great relaxation of the abdominal walls, with general visceroptosis; also of cases with heavy abdominal walls, and where the scar is imperfect as the result of drainage. These supports should be worn for several months, at the end of which time a straight-front corset may be substituted. In selecting a support for the abdomen certain qualifications are essential. The support should be comfortable to the patient, and hence should be made of light material that will

Fig. 621



Abdominal supporter.

readily absorb moisture, and with as little stiffening as will permit of a perfect adjustment to the body. It should be held in place by side straps that will not constrict the limbs. It should fit snugly about the hips and loosely about the waist line, thus giving firm support and at the same time elevating the abdomen. It should be easily adjusted to the body. The author finds that the Storm binder fills all these requirements except the last. It is not easy of adjustment.

Fig. 621 illustrates a binder that is easily adjusted, and provides good support without discomfort.

CHAPTER XXXIV

COMPLICATIONS FOLLOWING OPERATIONS

Surgical Shock
Pulmonary Embolism
Ileus
Pneumonia
Acute Bronchitis
Postoperative Pleurisy
Gangrene of the Lungs
Abscess of the Lungs
Pulmonary Edema
Local and General Infections
- Peritonitis
- Fermentation Fever
- Septic Intoxication
- Septicemia
- Pyemia

Breaking of Stitches
Postoperative Hernia
Postoperative Hematemesis
Retention and Suppression of Urine
Postoperative Neuroses
- Hysteria
- Neurasthenia
- Insanity

Tympanites
Phlebitis
Acute Dilatation of the Stomach
Vomiting
Postoperative Cystitis
Acute Nephritis
Traumatic Fistulæ
- Ureteral Fistulæ
- Vesical Fistulæ
- Rectal Fistulæ

Pressure Paralysis
Burns
Emphysema of the Abdominal Walls
Poisoning by Drugs
Infectious and Contagious Diseases
Diarrhea
Bed-sores
Acid Intoxication
Ophthalmia
Late Chloroform and Ether Poisoning
Irregularities of the Pulse
Excessive Pain
Variations in Body Temperature
Secondary Hemorrhage
Foreign Bodies Left in the Abdominal Cavity after Operation

Surgical Shock.—Surgical shock is a term often employed indifferently and is intended to indicate an extreme depression of the vital forces as the result of an impression made upon the nerve centres.

Reed defines shock as "an inhibition, more or less profound, of practically all the vital functions, due to defective vasomotor control, and characterized by diminished cardiac force, lessened arterial tension, embarrassed respiration, muscular relaxation, more or less complete arrest of glandular activity and mental lethargy, varying in the later stages into delirium."

Causes.—Shock may occur in the absence of an assignable cause even in the light of a postmortem examination. The known causes are as follows:

(*a*) *Excessive loss of blood,* or a moderate loss of blood in individuals who are anemic. Hence the importance of examinations of the blood as a precautionary measure prior to all major operations.

(*b*) *Prolonged anesthesia* is also a relative quantity in its effects upon the patient, depending not only upon the manner of its administration but upon the condition of the heart and blood of the patient.

(*c*) *General debility,* the result of wasting diseases, such as carcinoma, tuberculosis, and grave digestive disorders, which predispose to great depression as the result of operations under anesthesia. The condition of the heart, blood, blood pressure, and general nourishment are, as a rule, reliable indications of the general resistance of the individual. When the general resistance of the body is low, it is advisable to delay an operation of election until strength is restored through the judicious employment of rest, diet, and tonics. The all too prevalent disposition on the part of surgeons to operate upon their cases without due regard to such preliminary measures is to be deplored.

(*d*) *Prolonged exposure of the abdominal viscera to the air and to handling* by the surgeon and his assistants is not infrequently responsible for shock. All this can be largely prevented by keeping the intestines well covered with sterile gauze pads wrung out in hot sterile normal saline solution. However prolonged the operation may be, and whatever the manipulations required, there is no justification for the prolonged exposure of coils of bowel. The author is impressed with the importance of this precaution, and feels that it cannot be too strongly emphasized. Furthermore, there are many intestinal adhesions which should not be disturbed, not alone because of the attending shock, but still more because of the possible reformation of adhesions which might leave the patient in a worse condition.

(*e*) Shock is doubtlessly contributed to by fear and apprehension on the part of the patient. It is the author's belief that patients who go on the operating table with fear and trembling are more liable to shock. He is not certain as to just how much importance should be attached to this factor, but it is worthy of consideration. The surgeon who keenly appreciates the influence of these factors in the production of shock, and does all in his power to rigidly enforce the rules above laid down, will obtain the best results.

The subject of surgical shock should not be disposed of without reference to the valuable experiments of Dr. George W. Crile, who formulated the following factors contributing to shock:

1. Exposure of the abdominal viscera to the atmosphere, the profoundness of the shock varying inversely to the temperature of the air.
2. Manipulations of the peritoneum and underlying organs, the intensity of the shock increasing as the manipulations progress from the pelvis to the diaphragm.
3. Disturbance of the local vasomotor splanchnic areas.
4. Pressure upon important splanchnic veins, especially upon the vena cava.
5. Hemorrhage to a degree sufficient to lessen circulatory tension.
6. Early and late periods of life are most susceptible to shock.

Pathology.—No anatomical changes incident to shock have been observed; so far as known surgical shock only produces functional disorders referred to the sympathetic nerve centres. It is to be looked upon in the light of our present knowledge as essentially a neuroparalysis

due to exhaustion or irritation from causes above named. Crile has demonstrated certain anatomical changes to the cerebral cells.

Diagnosis.—The onset of surgical shock is sudden and is characterized by signs of general depression. The pulse becomes increasingly rapid, weak, and often irregular in force and frequency. This together with the evident pallor are the most reliable signs of impending shock. The pallid surface of the body is bathed in cold perspiration; the pupils dilate widely and fail to respond to the corneal reflex; the lips are bloodless; the finger nails are cyanotic; the eyelids drooping; the respirations shallow and largely abdominal; the temperature falls a degree or more below normal; the secretions are checked; response to stimulation is slow or wholly wanting. If there is a reaction from this state of depression all the vital forces are gradually restored, though with no regularity as to time and order of precedence. The color of the skin improves; the body warmth is slowly restored; the pulse increases in volume, becoming less and less rapid and irregular; the respirations deepen and are less rapid; the pupils contract and react to the corneal touch; general muscular control is restored, and the facial expression becomes more natural, indicating the return of consciousness.

The stage of profound depression continues a variable time, and results in death or gradual restoration. Delirium may follow upon complete mental and physical depression; the skin becomes dry and warm; the face flushes; the temperature becomes elevated; the pulse increases in volume; the patient tosses restlessly upon the bed and complains of thirst. The delirium may be violent or low and muttering, and is followed by a gradual restoration of consciousness or by collapse and death.

There is much said of delayed shock, the result of secondary hemorrhage or of toxins elaborated by the secreting organs through the influence of the anesthetic. Such a condition is serious and demands immediate investigation into the contributing factors.

The recognition of the foregoing clinical signs establishes the diagnosis, but there are certain conditions which closely simulate shock, and these are to be duly considered.

Hemorrhage.—The depression due to loss of blood is to be distinguished from that due to neuroparalysis in order that restorative measures may be effectually administered.

Many of the symptoms of hemorrhage are identical to those of shock. The increasing weakness, pallor, restlessness, and lowered temperature, in the presence of a possible cause for hemorrhage, suggest a careful search for a possible bleeding vessel. The lowered arterial tension is suggestive to the experienced observer.

Emboli.—Shock may be closely simulated by emboli of air, fat, or blood-clots. Primary respiratory failure and pain in the chest are the distinguishing features of pulmonary embolism.

Chloroform Asphyxia.—While chloroform asphyxia is often confused with shock, it is distinguished by the sudden onset and the quick response to the usual means employed in resuscitation; this is in contrast with

the more gradual development of the signs of depression and the slower response to restorative measures which characterize surgical shock.

Acute septic infection is not infrequently regarded as delayed shock. Here the signs of depression develop more slowly than in shock, the temperature rises, and the pulse-rate is rapid in proportion to the temperature. Leucocytosis, together with local manifestations of infection, should in most cases determine the diagnosis.

Prognosis.—The prognosis is largely determined by the manner of response to stimulation; the longer the reaction is postponed the graver the prognosis. Howard Kelly says that few patients recover when the temperature falls to 96° F. A pulse increasing in rapidity and developing delirium are signs of impending dissolution.

Treatment.—By far the most important consideration is the prevention of shock, this being largely under the control of the operator. The surgeon who gives the greatest consideration to the physical conditions of the patient prior to the operation, who discriminates wisely in his choice of anesthetics and anesthetizer, who operates with caution and with no undue loss of time, who avoids unnecessary exposure of the abdominal viscera and of the surface of the body, and who loses little blood in operations, will have a minimum of shock in his surgical experience.

Too much emphasis cannot be placed upon the preparation of the patient for operation. The general body strength should be increased by the judicious employment of rest, exercise, diet, and tonics.

When the blood is below 40 per cent. of hemoglobin and 2,500,000 red corpuscles, no major operation of convenience should be attempted until the blood has been brought to a safe standard, which would ordinarily mean an increase to at least 75 per cent. of hemoglobin and 4,000,000 red cells.

Bleeding from the uterus may be temporarily controlled by enforcing rest in bed, by the administration of ergot, and by a preliminary curettage or the application of the cautery to cancerous areas. In addition to these measures the uterus may be swabbed with perchloride of iron or packed firmly with iodoform gauze. By so checking the hemorrhage the blood will be more rapidly restored by the influences of rest, liberal diet, and blood tonics. There are individual cases demanding immediate surgical interference without regard to the blood and the general resistance of the individual. In such cases it is usually possible to choose a less radical procedure which, while not promising so perfect remote results, does give reasonable assurance of escape from the immediate dangers, and promises such a bettering of conditions as will afford a later opportunity to carry out a more radical course of treatment. For example, the patient is anemic and septic from a suppurative pelvic infection; vaginal drainage is made, leaving the removal of the involved organs to a later date, when the micro-organisms have lost their virulence, when the resistance of the individual has greatly improved, and when conservative measures, such as rest,

douches, and glycerin tampons, have accomplished all they can toward the restoration of involved structures.

Again, we may allude to cases of extra-uterine pregnancy in which so much blood has been lost that the patient is rendered extremely anemic; such cases may not brook delay, but call for a radical procedure in the face of grave dangers.

These and many other conditions may be cited wherein radical operations are performed in times of emergency, and with the almost certain result of grave depression.

Prolonged fasting and vigorous catharsis practised a day or more before the operation contribute to the lowered resistance of the patient, and should be judiciously regulated.

Furthermore, the practice of administering strychnine in the days preceding an operation is open to the objection that such patients do not respond so promptly to stimulation after operation.

The chilling of the surface of the body has been mentioned as a factor in the production of shock. To avoid this the operating room should be kept at a uniform temperature of 80° F., and all currents of air should be excluded. The extremities and chest should be snugly wrapped in blankets, and no part of the body should be exposed to the air except the field of operation.

Restorative Treatment.—Too much dependence must not be placed in such stimulants as strychnine, nitroglycerin, camphor, digitalis, caffeine, and whisky. The one great sheet-anchor in event of shock is normal salt solution. Whisky or brandy, in quantities of a half-ounce to two ounces, may be added to the salt solution, with good effect. The hypodermic administration of the sulphate of strychnine in doses of $\frac{1}{30}$ to $\frac{1}{20}$ grain, repeated every two to four hours, is a valuable adjunct to normal salt solution. Brown Miller extols the hypodermic injection of morphine, $\frac{1}{8}$ to $\frac{1}{6}$ grain, when there is restlessness.

The bed should be well heated with hot-water bottles, and a liberal supply of blankets should be provided.

When the pulse is weak it has been common practice to elevate the head of the bed ten to twelve inches. Experience has proved to the author that in this position the heart action is better, there is less nausea, less distress from gas pains, and the urine is voided with less difficulty.

The following instructions are given the nurses to guide them in the care of any patient in shock:

1. Elevate foot of bed twelve inches.
2. Wrap in warm blankets.
3. Place hot-water bottles about the body and lower extremities.
4. Give enema of one pint salt solution and two ounces of whisky.
5. If in profound shock, give subcutaneous injections of normal salt solution, one pint, and repeat every four hours while in shock.
6. Hypodermic injections of strychnine, $\frac{1}{30}$ grain, every four hours.
7. Keep room at a temperature of 80° F., but with abundance of fresh air.

Crile recommends the aqueous extract of adrenalin as a speedy though evanescent stimulant. He also proposes artificial respiration as a vasomotor and heart stimulant.

Pulmonary Embolism.—Pulmonary embolism is an accident that cannot be foreseen, and places the surgeon in an altogether defenceless position. We are indebted to Mahler for his carefully worked-out studies in the pathology and clinical signs of pulmonary embolism following gynecological operations.

Causes.—Thrombi which form in the femoral or pelvic veins become dislodged and are conveyed to the lungs. The absence of valves in the veins of the pelvis accounts for the frequency of pulmonary embolism following venous thrombosis of the pelvis. Prominent among the causes of thrombosis of the pelvic veins are the pelvic infections which involve the veins, and again, the anemias which result from the various conditions which lead to uterine hemorrhage.

In addition to these causes we may name as predisposing factors a retarded circulation from the pressure of tumors in the pelvis, incompetent heart action, obstructive diseases of the liver, lungs, spleen, and kidney.

It is said that pelvic thrombi are especially liable to form during the course of cancer of the uterus.

Dearborn reviews the work of twenty-five surgeons in Boston and vicinity, and concludes that thrombosis and embolism more frequently follow gynecological operations than operations in any other portion of the body. He believes that many cases of pleurisy, pneumonia, and pulmonary abscess following operations are due to pulmonary emboli. Schenck reported 48 cases of thrombosis in 7130 gynecological operations. Gessner reported 43 cases of pulmonary embolism, of which number 18 were operated for uterine fibroids; in these cases the thrombi were the result of pressure of the growth upon the veins. Gebele reports 14 cases of pulmonary embolism in 1196 laparotomies. Burkhard had 12 cases in 236 myoma operations, while Brown Miller had but 6 cases in 7000 operations, which did not include cases of postoperative pleurisy, some of which may have been due to embolism.

The dislodgement of a thrombus may occur during the operation, or hours, days, and weeks thereafter. Krusen observes that almost all fatal cases of embolism have occurred when the patient was doing well; often when the cure was considered complete.

Symptoms.—The intensity of the symptoms is in direct ratio to the size and number of the emboli.

When small and single the event may pass unnoticed, but, as a rule, there is precordial pain, dyspnea, and a quickened pulse, together with fear and apprehension on the part of the patient. When the emboli are large or in greater numbers these symptoms are more pronounced. Not only does the degree of symptoms depend upon the size and number of emboli, but as well upon the size of the obstructed vessel, the rapidity and completeness of the obstruction, the nature of the embolism, and

the general condition of the patient, with particular reference to the heart and kidneys.

When a large part of the pulmonary artery is suddenly and completely plugged, death may be instantaneous. In such cases the patient gasps for breath, is seized with intense precordial pain, the heart action is usually forceful, but may be weak and irregular, the face becomes cyanotic, and death is preceded by coma. Convulsions and opisthotonos are occasionally observed to immediately precede death.

Treatment.—Prophylaxis is the only line of procedure in the treatment of these cases. The frequency of the accident bespeaks careful preliminary preparation in the way of increasing the general nutrition.

When, because of local tenderness, pain, and edema there is reason to suspect the formation of pelvic thrombi, the greatest caution is to be exercised to prevent dislodgement. The patient is admonished to lie in bed for a longer period than usual, and all unnecessary manipulations of the limb are avoided.

When phlebitis develops the leg must be immobilized by a firm but soft bandage of cotton flannel and elevated on pillows. All liniments and massage must be proscribed. In the acute stage ice-bags should be applied to the course of the vein.

Ileus.—Ileus may be defined as a temporary or permanent paralysis of the intestinal peristalsis. It is known to arise from the following causes:

1. Strangulation of the bowel by intestinal adhesions.
2. Incarceration of an intestinal loop in an opening in the omentum.
3. Strangulation of the bowel by means of bands formed by the fixation of the uterus to the abdominal wall or about septic foci.
4. Volvulus.
5. Idiopathic.

Symptoms.—Paroxysmal griping pains, beginning at the seat of obstruction and increasing in intensity and frequency, are usually the first evidence of ileus. The peristaltic wave of the bowel above the point of obstruction in such cases may be seen with the eye and felt with the hand. When the obstruction is not complete, the gas and fluid contents of the bowel, in escaping past the point of partial obstruction may produce an audible gurgling sound.

All efforts to evacuate the bowel fail. The paroxysmal pains are soon followed by nausea and vomiting, which becomes fecal. Tympany develops and becomes extreme; then follows rapid, shallow breathing and embarrassed heart action.

Exhaustion is the inevitable result; the face becomes pinched, the eyes sunken, the intellect dulled, the pulse rapid and feeble. As dissolution approaches the vomiting ceases and the patient becomes quiet. Death is the result of exhaustion or of peritonitis, arising from a gangrenous gut.

Diagnosis.—It is of the greatest importance to recognize the condition before the strength of the patient is exhausted and the bowel becomes gangrenous.

In gaseous distention of the bowel, particularly when there is a relaxed condition of the abdominal walls which permits of great distention of the abdomen, fear is often entertained lest an ileus be present. The abdominal pains, distention of the abdomen, nausea and vomiting, embarrassed respiration, and obstipation present a clinical picture that closely simulates ileus. However, the general depression is never so marked and efforts to move the bowel will eventually be successful.

The clinical differentiation of peritonitis from ileus may be impossible; as a matter of fact, the two conditions frequently coexist or one follows the other. Rise in temperature is in favor of peritonitis; while not invariably present in peritonitis, it is the rule, while in ileus, independent of infection, there is little or no rise in temperature. The peculiar and rather characteristic paroxysms of pain in ileus are not present, as a rule, in peritonitis. In peritonitis the pain is more diffuse and continuous.

Treatment.—*Prophylaxis* is of paramount importance in that much can be done to prevent the development of ileus.

In the breaking up of adhesions within the abdomen all raw surfaces should be carefully covered with peritoneum as far as possible, and when this cannot be done the raw surfaces should be charred with a Paquelin cautery. The author has had repeated opportunities to observe the after-effects of charring a raw surface with the thermocautery in cases which were opened for the second time several months after the initial operation, in which adhesions were broken up and the raw surfaces were cauterized. In all of these cases few if any adhesions reformed on the charred surfaces.

Not all intestinal adhesions should be broken up. Unless they are evidently causing disturbance it is not advisable to disturb them, because they may re-form in such a manner as to cause obstruction.

One of the objections to ventrosuspension of the uterus is the false band which develops and is liable to strangulate the bowel. The same objection is made to the Gilliam operation of suspending the uterus by the round ligaments.

Omental tears should be restored for fear of strangulation of the bowel through the opening.

The utmost care must be taken in coapting the peritoneal surfaces in the closure of the abdominal incisions. The peritoneal margins should be everted if adhesions to the bowel and omentum are to be avoided.

Care should be taken not to handle the bowel roughly, as in mopping with sponges, for fear of creating adhesions. Dry sponges should be avoided.

Whenever coils of bowels are adherent in such a manner as to cause partial obstruction, they must be released and all knuckles of bowel straightened out, and the raw surfaces covered with peritoneum or charred with the cautery. Filling of the abdomen with salt solution after the completion of an operation, and immediately before the last peritoneal stitches are taken in closing the abdominal incision, will favor the readjustment of the coils of bowel.

Conservative Treatment.—Conservative treatment may be persisted in so long as the vomiting is not stercoraceous, the pulse increasing in rate, and the strength failing. Up to this point efforts may be persisted in to force the opening of the bowel by the administration of calomel and salts in repeated small doses, and by the use of enemata.

Calomel and soda bicarbonate in half-grain doses may be repeated hourly until four grains are given, then discontinued for twelve to eighteen hours, and again continued for a like period of time. Epsom salts may be given in one to two hours following the last dose of calomel.

Turpentine enemata, 1 dram to 1 pint of warm water, may be given one or more times daily. An efficient enema will be found in one pint each of warm milk and molasses.

After persisting in this treatment for two or three days, or until the condition of the patient fails to improve, but, on the contrary, proceeds unfavorably, all tentative measures must be abandoned and radical measures adopted.

Operative Treatment.—Every possible precaution should be taken to prevent the further lowering of the resistance of the patient. The operating room should be at a temperature of 80° F., and the body wrapped in warm blankets. The stitches are removed and the abdominal wound spread open. A thorough digital and ocular examination should be made of the abdominal and pelvic viscera, and if necessary the intestines are removed from the abdomen and covered with hot towels. One should not be content with the finding of a single cause for obstruction, but the search must be continued until all possible causes are excluded. In examining the loops of bowel, proceed in an orderly manner from below upward until all parts of the bowel have been inspected. When the bowel has been so injured as to suggest a possible source of infection, abdominal drainage should be established as a precautionary measure.

When the peritoneal covering of the bowel has been partially stripped off it may be stitched back upon the bowel with No. 1 plain catgut. Injuries to the muscular coat of the bowel are more securely repaired with silk or linen.

When there is great distention of the gut it may be advisable to open the bowel as described under peritonitis. If gangrene exists the affected gut is excluded from the peritoneal cavity by stitching the bowel to the abdominal incision and incising it after adhesions have formed.

If the mesentery has been so injured as to shut off any considerable blood supply to the bowel, the only safe procedure is to resect that portion of the bowel which has been robbed of its supply.

The abdomen is closed with through-and-through silk or silkworm-gut sutures and a fresh dressing applied.

The usual stimulants are administered following the operation. Drastic measures should not be employed to move the bowel after the operation; if the obstruction has been removed there will usually be a spontaneous evacuation of the bowel within twenty-four hours.

Adynamic or *paralytic ileus* presents no lesion other than the distended bowel. It seldom occurs, and there is no known cause. Injuries to the mesenteric nerves, the prolonged administration of opiates, prolonged exposure of the intestines to air and to handling, and rapidly developing peritonitis and toxemia, are supposed causal factors.

Pneumonia.—Pneumonia may follow upon an operation within a few hours, but, as a rule, not before the third to seventh day.

Causes.—The predisposing causes, so far as known, are chilling of the surface of the body before, during, and after the operation; irritating properties of an anesthetic, notably of ether; inhalation of foreign substances during the anesthetic; intemperance, prolonged recumbent position, season of the year, embolic infarction of the lungs emanating from foci in the pelvis, and the awakening of latent or localized infections of the respiratory tract. Postoperative pneumonia occurs no more frequently after laparotomies than after vaginal operations.

Advanced age is a predisposing factor; Döderlein found 27 of his 100 cases of pneumonia following laparotomy were in women over seventy years of age; this was opposed to 3 or 4 per cent. in girls, whose ages ranged from eleven to twenty years.

According to Lindermann and Hölscher, ether is not directly irritating to the bronchial mucous membrane, but excites an excessive secretion of mucus in the throat, which in turn sets up a pneumonia. It has been clearly shown in the clinic of Mikulicz that postoperative pneumonia is almost invariably due to the inspiration of mucus and foreign particles into the bronchi, hence the anesthetic which produces the greatest secretion in the throat is most likely to be followed by pneumonia. More than this, all conditions which embarrass expectoration after operation predispose to pneumonia; such, for example, is general weakness, pain on exertion, weakened heart action, coma, delirium, tight binding of the chest and abdomen, and tympany which embarrasses the excursions of the diaphragm.

That a large number of lung complications following operations are due to the anesthetic is evidenced by the statistics of Mikulicz, who found in 1005 laporotomies performed under general anesthesia that the pneumonic morbidity was 7.5 per cent. and the mortality 3.4 per cent.

The essential factors in the development of pneumonia are the pathogenic bacteria, of which may be mentioned the bacillus coli communis, bacillus pneumoniæ of Friedländer, pyogenic cocci, and the micrococcus lanceolatus.

Pathology.—In 52 postmorten examinations of postoperative infections of the lungs following abdominal sections, 7 showed a fibrinous lobar pneumonia, 17 a gangrenous condition of the lungs, 2 a serofibrinous pleuritis without changes in the lungs, and in 5 there were pulmonary emboli.

Symptoms.—The time of onset of postoperative pneumonia varies greatly. When due to the anesthetic the symptoms are usually manifest by the end of the first twenty-four hours, while septic pneumonia,

due to embolic infarction is not usually manifest prior to the seventh day, and may be as late as the second and third weeks.

The clinical signs and symptoms do not differ essentially from those of the ordinary forms of pneumonia. The increase in the respiratory rate, the pain in the chest, the mucopurulent expectoration, and the physical signs of consolidation may all be present, though they are by no means constant. Death may occur and the autopsy may give the first intimation of an involvement of the lungs.

In pneumonia due to anesthesia the prognosis is relatively good, but in septic pneumonia the outlook is always grave.

Treatment.—*Prophylactic treatment* is of the highest value, for much can be done in the way of preventing postoperative pneumonia.

The temperature of the operating room should not be below 70° F., and all draughts of air should be excluded. The trunk and lower extremities should be wrapped in warm blankets. Throughout the first week of convalescence the sick room should be kept at a uniform temperature of 70° to 75° F., and no draughts should be permitted. No patient, save in an emergency, should be operated when suffering from an acute irritation of the respiratory tract, and in chronic infections of the throat, bronchi, and lungs, chloroform should be chosen in preference to ether.

Unless contra-indicated the author administers a hypodermic injection of morphine sulphate, $\frac{1}{4}$ grain, and atropia sulphate, $\frac{1}{150}$ grain, thirty minutes before the anesthetic is started. This lessens the amount of mucus secreted in the throat, and thus becomes an important factor in the prevention of postoperative pneumonia. No anesthetic should be given in the presence of food in the stomach, and hence no solid food should be taken for twenty-four hours preceding the operation. In cases of emergency the stomach should be washed out before the administration of an anesthetic. A good procedure is to encourage the patient to drink large quantities of water up to one hour before the operation; this will cleanse the stomach and do much to prevent vomiting both during and after the operation.

The prevention of vomiting and the filling of the throat with mucus is largely under the control of the anesthetizer. When mucus fills the throat it should be immediately swabbed out with bits of sterile gauze grasped by forceps.

A warm flannel jacket worn after the operation will protect the chest.

The active treatment of postoperative pneumonia does not differ essentially from that of ordinary forms of pneumonia. The reader is referred to standard works on internal medicine.

Acute Bronchitis.—Acute bronchitis is a frequent postoperative complication. It may be independent of or combined with pneumonia. The causes are the same as for pneumonia. The symptoms and treatment do not differ from those of the non-operative types.

Postoperative Pleurisy.—Postoperative pleurisy, independent of pneumonia, embolism, and tuberculosis of the lungs and pleura, is an

unusual occurrence as compared with the number of cases so diagnosticated. The fact that these cases almost invariably recover leaves one in doubt as to the actual frequency of the lesion.

The acute lesion occasionally results from the awakening of a latent tuberculosis of the pleura. More commonly the infection begins in the lungs and extends to the pleura.

Symptoms.—The symptoms of postoperative pleurisy are those common to the ordinary type. There is the sharp lancinating pain in the chest that is aggravated by deep breathing, the hacking cough, the temperature rising to a variable degree, though seldom high, and the friction rub detected over the painful area. Prophylaxis does not differ from that of pneumonia, and the active treatment is that laid down in text-books on internal medicine.

Gangrene of the Lungs.—Gangrene of the lungs is fortunately a rare complication. It usually arises from the aspiration of vomitus during the anesthetic. Emboli containing putrefactive bacteria may give rise to the lesion. The diagnosis from other lung affections is largely arrived at by the character of the sputum, which is fetid and of a greenish color.

Abscess of the Lung.—Abscess of the lung is of less common occurrence than gangrene if we exclude the complications of general pyemia.

Pulmonary Edema.—Pulmonary edema may arise from the irritating action of the anesthetic upon the lung and from paralysis of the vasomotor centre. An incompetent heart and kidney predispose to the condition.

Noble believes that an overfilling of the bloodvessels with salt solution predisposes to edema of the lungs, also that filling the abdominal cavity with salt solution and elevating the foot of the bed aggravate and may originate the condition.

Local and General Infections.—**Local Infections.**—Of the local infections the most common is the so-called stitch abscess. A thick abdominal wall is particularly prone to suppurate, inasmuch as such infections commonly take their origin in the fatty tissues. A number of conditions predispose to the development of septic foci in and about the abdominal incision. First in point of frequency is a lack of surgical cleanliness in the preparation of the suture material, gauze, and instruments, in the preparation of the field of operation and hands of the operator and assistants, and in faulty technic on the part of the surgeon. Less common causes are the too tight tying of the sutures, the leaving of dead spaces in the abdominal wall through failure to accurately approximate the various layers in the abdominal incision, and finally through the rough handling of the tissues by the retractors and hands of the operator and assistants.

These infections may give rise to no symptoms, and may not be suspected until the dressings are removed for the purpose of taking out the stitches. As a rule, however, there is an elevation of temperature amounting to 1° or 2°, beginning about the third or fourth day, together with some discomfort at the site of the incision. The

pulse does not rise proportionate to the degree of fever. If the septic focus is superficial, tenderness, redness, and edema will mark the location. Large quantities of pus may be buried deeply in the abdominal wall in the absence of any superficial evidence of infection, and with slight rise of temperature; such abscesses are usually located in the adipose tissue of the abdominal wall. When the pus burrows into the muscular wall the tension is great, and hence the early rise of temperature and pain. Such abscesses may fail to open externally; they may burrow far and wide, and have been known to open into the abdominal cavity, and to result fatally. Kelly reported three such cases occurring in the Johns Hopkins Hospital.

If the abscess is not recognized and drainage established, it will usually find its way to the surface and break externally within five to twenty days.

When the temperature rises after the third day of an operation the wound should be carefully inspected. If, at the site of one or more stitches, there is found an area that is reddened, indurated, and tender, a stitch should be removed and the involved area explored with a grooved director in the effort to disclose the presence of pus. If pus is found, free drainage must be established by removing the necessary number of stitches and opening up the abscess cavity through the line of incision. Sterile gauze dressings are then applied; these are reapplied as often as may be required to keep the abscess empty and the surface free of accumulated secretion. Peroxide of hydrogen is extensively used as an injection into abscess cavities. This preparation is of special value when the abscess is sinuous. When the inflammatory reaction is widespread it is well to apply hot antiseptic fomentations; for this purpose an effective combination is hot sterile water 2000 parts, glycerin 40 parts, and formalin 1 part. With such infections there is always the subsequent danger of spreading of the scar along the line of incision. To avoid this the tension should be relieved by strapping the abdomen with adhesive strips, which pass from the sides of the abdomen over the dressings covering the incision. After the wound has healed and the stitches are removed, an elastic abdominal support should be worn for several months, removing it only when retiring for the night.

The author has observed wounds to appear perfectly healed and without pain or temperature, yet at the end of a period of days and possibly weeks an abscess has opened upon the surface. He has credited this mishap to the presence of chromic catgut placed in the deep fascia, and for this reason he now seldom employs chromic catgut in suturing abdominal incisions.

Peritonitis.—For the discussion of peritonitis see Chapter XXI.

Fermentation Fever.—Fermentation fever is a term which dates back to the time of Billroth and von Bergmann, who characterized this type of infection as one caused by the absorption of ferment products into the circulation. Mild febrile symptoms were credited to this cause.

Angerer and Edelberg injected into the bloodvessels of animals

definite quantities of blood containing fibrin ferments, and thereby produced a slight rise in temperature; the conclusion was that the absorption of fibrin ferments was responsible for the slight febrile reactions following operations.

This so-called fermentation fever usually sets in within the first twenty-four hours following operation; it seldom exceeds 101° F., and continues one to four days, then gradually recedes to the normal. Occasionally the temperature is found at 99° to 100° F. at some time in the afternoon for two to four weeks. The febrile reaction is usually in direct proportion to the extent of the operation.

No doubt the term "fermentation fever" is loosely applied, and in reality embraces all sorts of infection of low virulence. All varieties of bacteria can give rise to such a condition, and, moreover, certain, not generally recognized anaërobic microörganisms which fail to grow on the ordinary culture media, also may give rise to this form of fever. It is, therefore, self-evident that the term fermentation fever is ill advised, and serves as a cloak for ignorance.

Septic Intoxication.—Septic intoxication is another term loosely employed and capable of misapplication. It is intended to designate that form of infection which is dependent upon a septic focus from which toxins are absorbed into the general circulation.

Symptoms.—The onset of the symptoms is usually gradual, the fever may rise to an alarming degree, and result fatally. In such cases the temperature may rise to 105° F., the pulse to 140 to 180. The later the signs of infection become manifest the greater the supposition that there is a focus of infection developing in the tissues from which toxins are being absorbed.

Prognosis.—The prognosis is dependent upon the variety of infecting microörganisms, their number and virulence, the location of the area of infection, and the absorbing and resisting powers of the tissues. It is possible for death to occur within a few hours.

Treatment.—The management of these cases must be prompt and intelligent. The focus of infection must be sought and efficient drainage established. With this accomplished the septic intoxication will take care of itself, unless extreme, when elimination of the toxins must be accomplished by promoting the secretions of the bowel, skin, and kidneys. This is done by the administration of saline cathartics, enteroclysis, or hypodermoclysis and hot packs. For stimulation, whisky and strychnine should be administered.

Septicemia.—True septicemia is a form of toxemia in which the microörganisms exist and multiply in the blood. It has been described as a "disease without demonstrable lesions," but such a definition will not hold, inasmuch as the site of the initial infection always reveals microscopic changes; furthermore, as a result of general intoxication, parenchymatous changes exist throughout the body.

The streptococcus is notably disposed to cause septicemia, though other microörganisms are occasionally observed to do so, *i. e.*, the staphylococcus pyogenes albus, aureus, and citreus, colon bacillus,

bacillus typhosus, gonococcus, proteus vulgaris, micrococcus lanceolatus, and the bacillus of Friedländer.

Pyemia.—The characteristic feature of pyemia is the distribution of metastatic abscesses remote from the original point of infection.

Pyogenic bacteria and infected thrombi gain access to the blood-stream, and are deposited in various tissues and organs of the body, there to develop abscesses containing the same variety of germs as found in the original site of the infection.

There are wide excursions in temperature, varying from normal at some hour of the day to 105° F. at other hours of the same day. The time of rise of temperature is inconstant, but, as a rule, the maximum is reached about noon, and by evening the temperature has fallen to near the normal. The pulse is relatively rapid, but follows the excursions of the temperature. There is marked leucocytosis, and cultures may be obtained from the blood. Seldom do such cases recover, death being the result of focal abscesses leading to general exhaustion.

It is seldom that pyemia develops independent of puerperal infection. Endocarditis and metastatic abscesses are characteristic lesions of this sort of infection. No lesion may be demonstrable in the pelvic viscera.

No portion of the body is exempt from the invasion of septic emboli and the development of metastatic abscesses.

Treatment.—The treatment of septicemia and pyemia consists in supporting the patient by a nutritious, easily digested diet, and by liberal doses of strychnine and whisky. Antistreptococcic serum in large doses should be given early in the course of the infection.

All metastatic abscesses, if accessible, should be opened and drained, and finally palliative measures should be employed to render the patient as comfortable as possible. The temperature may be controlled by cold sponging. Fresh air and nourishing food are the most essential factors in the management of these cases. Little dependence can be placed on serums and vaccines.

Breaking of Stitches.—It is possible for the wound to open by the giving way of the stitches. The author has personal knowledge of two such cases. Brown Miller refers to 10 cases known to him, and to 157 cases reported by Madelung. It is therefore fair to assume that the accident occurs more often than we are aware.

We may say that faulty closure of the wound is the usual underlying cause of the accident. If the suture materials are reliable, the wound closes properly, and the abdomen is securely supported by bandages, no amount of exertion on the part of the patient should cause the suture to give way.

At the time when abdominal incisions were closed by through-and-through sutures of silkworm gut or silk, the accident was more liable to occur than now when layer after layer of catgut is used, and when the abdominal wall is thick, interrupted stay sutures of linen, silk, or silkworm gut are used.

The common practice of strapping the abdomen with strips of adhesive plaster and placing over this a well-fitting muslin binder adds

much to the security of the wound. A selection of suture materials with strong tension power is of importance.

The wound has been known to separate as late as the ninth day, and in the absence of suppuration. When suppuration of the wound occurs in wounds closed with catgut and not supported by through-and-through sutures of non-absorbable material, special attention must be given the supporting strips of adhesive plaster for fear of complete separation of the wound. Madelburg says the critical days are the eighth and ninth after operation.

In both cases observed by the author the greater part of the small bowel extruded through the incision. A loop of gut may protrude into but not through the incision, and a plastic exudate may organize about the protruding gut and omentum. Death is the result of strangulation of the bowel or peritonitis.

Treatment.—The treatment depends upon the conditions found. If there is no infection visible the gut is replaced, drainage established, and the edges of the incision freshened and again sutured. When pus exists and is walled off from the general peritoneal cavity, care should be taken to avoid entering the peritoneal cavity; free drainage is established and the wound approximated by adhesive straps.

When general peritonitis or obstruction of the bowel exists, the general line of treatment proposed in the previous pages should be followed.

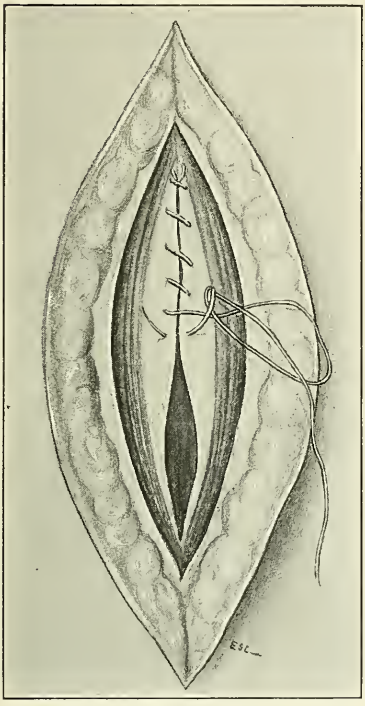
FIG. 622

Iodoform gauze dressing held in place by tying interrupted silkworm-gut sutures over the gauze.

Closure of the Abdominal Wall.—Figs. 623 to 626 present a well-accepted method of closure of the abdominal wall. The several layers of the abdominal wall are accurately coapted without undue tension. When the abdominal wall is thick or when there is great intra-abdominal pressure, the author usually passes two to four interrupted silkworm-gut sutures after closing the peritoneum. These sutures are passed through all structures with the exception of the peritoneum. They are not tied until the wound is completely closed (Fig. 622), then several layers of iodoform gauze are placed over the line of suture and the silkworm-gut sutures are tied over the gauze. This provides a permanent dressing, and prevents the cross-marks of the sutures.

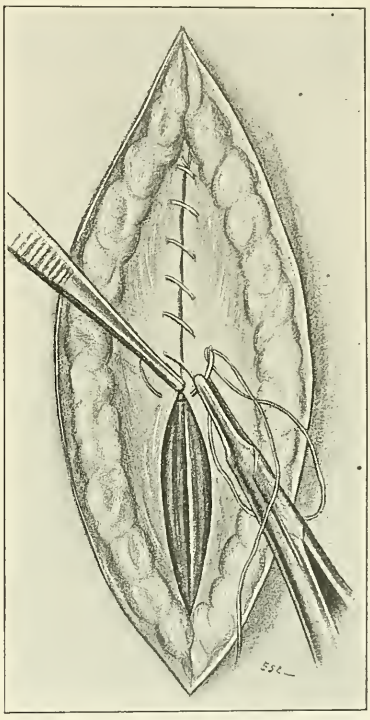
Postoperative Hernia.—The careful coaptation of the various structures which form the abdominal wall by means of catgut sutures and the exclusion of infecting microörganisms have done much to eliminate postoperative hernia.

Fig. 623



Closure of the abdominal incision. Continuous suture of No. 1 plain catgut in the peritoneum.

Fig. 624



Closure of the abdominal incision. Continuous suture of No. 2 plain catgut in the sheath of the recti muscles.

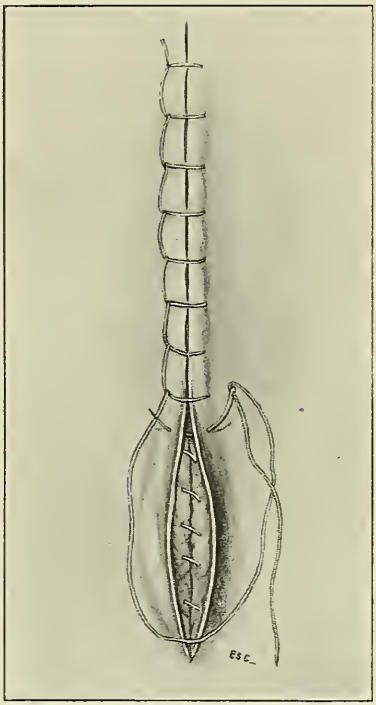
Other measures tend to prevent the occurrence of hernia in the line of incision. In this connection may be mentioned the application of adhesive straps in the dressing of the wound after operation (Fig. 612), and the wearing of an elastic abdominal supporter for three to six months following an abdominal section (Fig. 621).

The greater the thickness of the abdominal wall the greater the liability to postoperative hernia, and hence the greater need for careful coaptation of the various layers of the abdominal wall, of excluding infection, and of wearing an abdominal support subsequent to operation.

Abdominal drainage should be excluded whenever possible, if for no other reason than that drainage predisposes to the development of hernia.

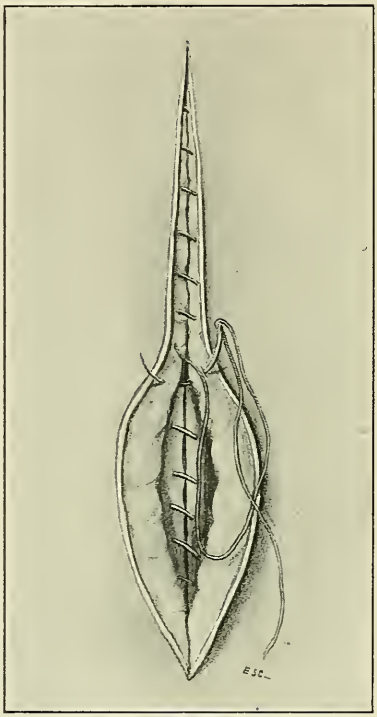
The size of such herniæ may be that of the patient's head. The contents are omentum and loops of the small bowel, one or both. These structures may be adherent to the hernial sac, and therefore become incapable of reduction.

Fig. 625



Closure of the abdominal incision. Continuous suture of No. 0 plain catgut in the subcutaneous fat. To be used only when the abdominal wall is thick.

Fig. 626



Closure of the abdominal incision. Mattress suture of horse-hair to approximate the skin.

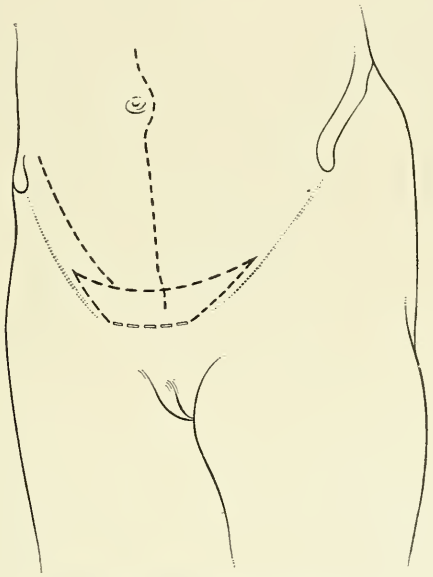
Treatment.—There is no encouragement in the effort to support the hernia by padded abdominal binders. In spite of all that can be done the hernia may enlarge. Operative treatment should therefore be early instituted, and the earlier the operation is performed the better.

Technic of Operation.—An oval incision is made about the base of the hernia. This should be made with great caution for fear of injuring the bowel, which commonly lies immediately beneath the skin and subcutaneous connective tissue. The peritoneum is cautiously incised, for it often happens that the bowel lies adherent to it. With the index and middle finger inserted through the peritoneal incision as a guide, the operator opens the peritoneum in the line of the skin

incision, then removes the entire oval flap, consisting of skin, subcutaneous connective tissue, and peritoneum. This leaves an oval opening into the free abdominal cavity. All adhesions binding the omentum and bowel must be freed by fingers or scissors. If a large portion of the omentum protrudes into the hernial sac it should be ligated with catgut and amputated, taking care that the stump of omentum is rolled in so that adhesions cannot form.

A gauze pad is placed over the bowel while dissecting out the fibrous ring. In order that the rectus muscles and overlying fascia may be exposed for suturing, the fibrinous ring must be dissected away in strips by means of scissors, and when removed the hernial opening will be found much enlarged.

Fig. 627



Lines of incision in the abdominal wall.

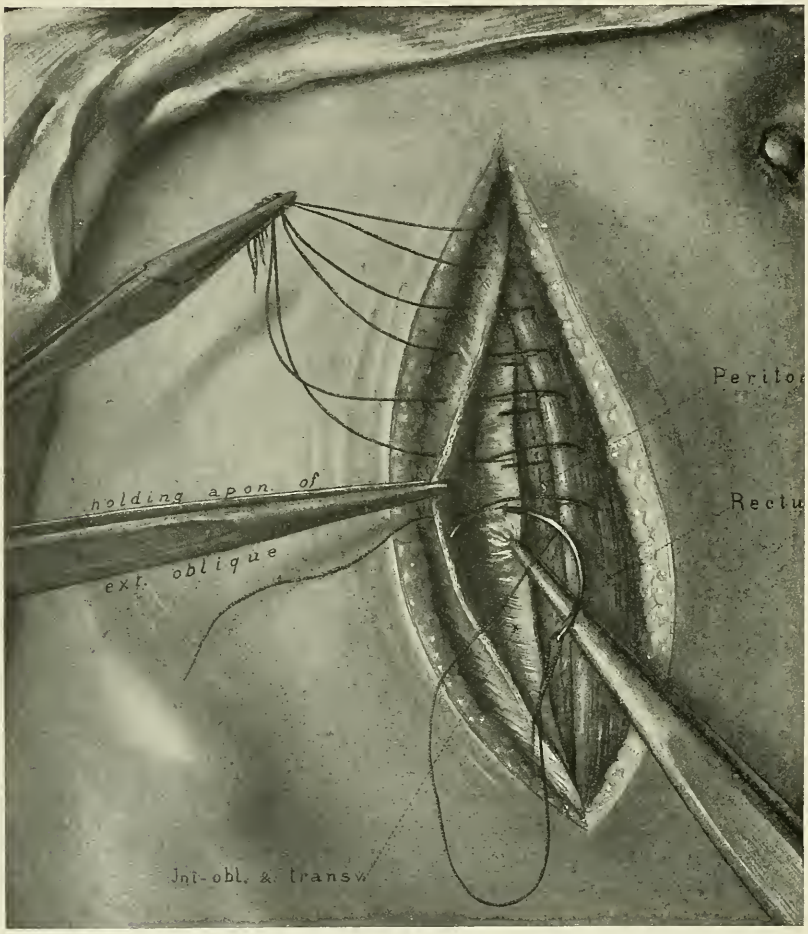
After the dissection of the scar tissue the margins of the hernial opening will be found to be the structures which make up the abdominal wall at this point, and they are approximated layer by layer with sutures as follows:

The peritoneum is closed in a vertical direction by a running catgut suture. Next mattress sutures of silk or linen are placed so as to include the recti muscles and overlying fascia. This secures an overlapping of the fascial structures. The overlying structures, subcutaneous fascia, fat, and skin are closed by interrupted catgut sutures. The patient should be confined to her bed for fourteen to sixteen days, during which time the abdomen is well supported with adhesive straps. An

abdominal binder should be worn for several months following the operation.

Postoperative Hematemesis.—Hemorrhages from the stomach may follow upon ligation and resection of the omentum.

Fig. 628



Showing operation for hernia. Dovetailing rectus between the broad abdominal muscles. (Kelly-Noble.)

Friedrich and Hoffmann concluded from animal experiments that such hemorrhages were often the result of the dislodgement of thrombi in the omentum and their lodgement as emboli in the vessels of the walls of the stomach.

It has been observed that hemorrhages from the stomach are more liable to follow chloroform anesthesia, and the explanation is given that

chloroform has a destructive effect upon the red corpuscles; this, however, would appear doubtful, because in the experiments of Friedrich and Hoffmann, the emboli found in the walls of the stomach after operations upon the omentum occurred just as frequently when no anesthetic was administered.

Retention and Suppression of the Urine.—In all abdominal operations the amount of urine secreted is more or less diminished. No anxiety need be entertained unless the amount falls below 10 ounces in twenty-four hours, or when evidences of nephritis are found in the urine. By the end of the first week, and certainly not later than the twentieth day, the amount of urine secreted should be normal. When the amount secreted falls below 10 ounces in twenty-four hours, or persists below the normal quantity an undue length of time, there is a suspicion of the existence of some affection of the kidney or of some interference with the flow of urine, as from the accidental ligation or wounding of the ureter.

Pain in the region of the kidney, with possible enlargement of the organ, is additional evidence of an obstructed ureter.

The constant or intermittent dribbling of urine into the vagina following a vaginal section needs careful investigation, in view of finding a possible vesicovaginal or ureterovaginal fistula.

The amount of urine is materially increased by the injection of quantities of salt solution into the bowel shortly after operation, or into the abdominal cavity after the completion of the operation and before the peritoneum is completely closed.

For some time the author has practised as a routine measure in all major operations the injection of a pint of normal salt solution, and 2 ounces of whisky into the bowel immediately after operation. This injection without whisky may be repeated every four to six hours, until the amount of urine secreted is not less than 20 ounces in twenty-four hours.

Postoperative Neuroses.—After operations there may develop one of the several forms of neuroses, notably hysteria, neurasthenia, melancholia, and insanity. It is probable that in all these cases the individual is endowed with an unstable mentality.

Hysteria.—The danger lies in a false interpretation of symptoms whereby grave conditions are mistaken for hysteria. Hysteria, in itself, is a troublesome though not dangerous condition; it is a psychic disease, and therefore demands psychic treatment.

Neurasthenia.—Here, again, we encounter a psychic disease requiring psychic treatment. This condition commonly ensues when the uterus or ovaries have been removed, and may persist for an indefinite time. Other predisposing causes are anxiety, overwork, exhaustion, suppuration, and anemia.

Insanity.—It has not been conclusively demonstrated that insanity follows upon gynecological procedures with greater frequency than upon those in general surgery. Yet it must be admitted that the frequency with which it follows upon gynecological operations suggests the importance of its consideration.

Kelly estimates that it has occurred in about 0.5 per cent. of his abdominal cases, and in about the same ratio in his plastic work on the pelvic floor. Indeed, it would appear that insanity more often follows upon minor than upon major operations, and may follow the administration of an anesthetic without operation.

The author has seen but one case of abdominal section, in which the patient suffered from long-standing melancholy, which deepened into insanity, and led to suicide in the fourth week of convalescence.

Insanity may follow the induction of the menopause by the removal of the ovaries, or may be excited by fear, anxiety, suffering, suppuration, loss of blood, drug intoxication, nephritis, or exhaustion. It may be asserted that in all cases the individual is a neurotic to begin with; if she were not so the above-named predisposing factors could not bring her to the state of insanity.

It is said that fully one-half of these cases recover control of the mind within one to six months.

No suggestions are here offered as regards treatment of these cases beyond the advice to guard them carefully. These are cases for the alienist.

The popular impression that the removal of the ovaries particularly predisposes to insanity has no foundation in fact. Neurotic, hysterical, and melancholic women are prone to become insane, and the same may be said of those who have previously been insane.

While the insanity may remain permanent, as it occasionally does, it is to be expected that the patient will gradually improve and relief be complete in a relatively short time.

Le Roy Broun, after reviewing his own experience and that of others in operations upon pelvic diseases in insane women, says:[1] "We regard these patients as having a right to be relieved of their physical suffering, and when such relief can be given through surgery, it is the desire in the Manhattan State Hospital that such will be afforded them.

"It is in this spirit that such operations have been done. With the physical improvement resulting, some of the patients have gone on under the regular hospital treatment to a complete mental recovery.

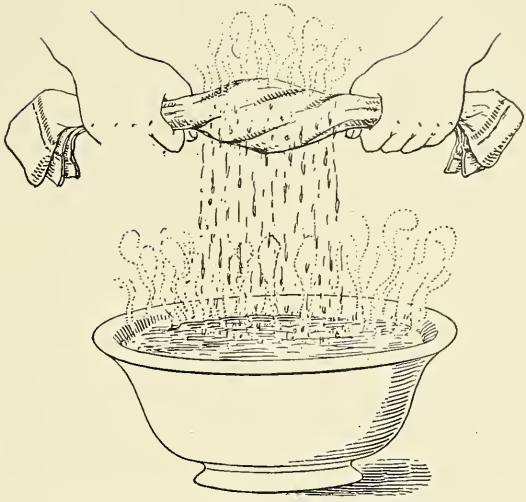
"One such cure of the patient's mental disturbance is more than a balance against many failures. This is especially true, since in no instance in the experience of Manton, of Picque, and myself has the mental state of any patient been injured by the operation itself."

To operate for the relief of insanity is a hazardous procedure and one that is never justified. It is the lesion in the pelvis which alone should constitute the indication for operation, and having such an indication in the insane, the surgeon may proceed in the hope that improvement in the mental condition may follow.

Tympanitis.—This is one of the most distressing of the complications following abdominal operations. Tympanitis occurs most frequently in women with thin, relaxed abdominal walls. In the majority of cases

[1] Trans. Amer. Gyn. Soc., 1905.

Fig. 629



Hot cloths are prepared for application to the abdomen.

Fig. 630

Application of hot fomentations to the abdomen for relief from gas pains. Abdominal dressing is protected by oil silk.

it does not denote a serious pathological condition, but may be regarded merely as a symptom. When extreme the respirations and heart action are embarrassed and there is much suffering.

Much can be done to prevent overdistention of the abdomen. The bowels should be thoroughly evacuated before operation, they should be handled as little as possible in the operation, and after the operation, unless contra-indicated, they should not be opened within seventy-two hours. The Fowler position will aid in the expulsion of gas. When the abdomen is thin and relaxed it should be well supported with adhesive straps and binder.

For the relief of gas distention the author gives hypodermic injections of eserin in $\frac{1}{50}$ grain doses as required. The rectal tube is inserted at intervals or left permanently in place. Enemata of salts ʒj, turpentine ʒj, and sweet oil ʒiij, or of equal parts of warm milk and molasses, may be effectual in bringing away the gas. Hot turpentine stupes are applied to the abdomen. Hoffmann's anodyne, in doses of 20 minims to 1 dram, given by the stomach, will often afford relief.

Kelly recommends the light application of the Paquelin cautery to the tips of the hairs, without actually coming in contact with the skin.

John G. Clark reports the adoption of the plan of inactivity for the first four or five days in the management of the bowels. On the fourth or fifth days, if the bowels have not moved spontaneously, an enema is given. He says that, as a rule, his patients are comfortable and are seldom troubled with gas. The author's experience is in accord with that of Clark.

Phlebitis.—A not infrequent postoperative complication is thrombophlebitis. It occurs about once in 150 abdominal operations on the pelvic organs, and is most often seen in cases of pelvic inflammation, carcinoma of the cervix, fibroids of the uterus, and ovarian tumors.

The femoral vein is most often involved. In the majority of cases but one side is involved; possibly the left more often than the right. When both legs are involved it is assumed that the thrombus has involved the common iliac vein.

As predisposing factors anemia is of prime importance. The author once observed the pressure of a long abdominal retractor upon the left femoral vein, and within two days symptoms of thrombophlebitis were manifest in that side. Infection is also a prominent causal factor, as is pressure from pelvic tumors.

The symptoms pointing to thrombosis of the pelvic veins, but not involving the femoral veins, are too indefinite to permit of more than a conjecture. There may be pelvic pain associated with rise of temperature and pulse-rate, with possibly evidence of pulmonary embolism.

When the femoral vein is thrombosed the diagnosis is not difficult to make. At the onset the temperature usually rises from 2° to 4°, and the pulse is relatively rapid. Preceding the rise of temperature there is more or less severe pain in the groin, which extends a variable distance along the course of the femoral vein. Early in the course of the affection

there is a variable degree of swelling of the leg, and this may extend to the thigh. The course of the vein may be traced by a livid blue line and by its tenderness and sharp outline on palpation. These symptoms continue a variable time and then quickly or slowly recede. Serious consequences may result from a dislodgement of the clot, with embolic infarctions in the lungs or elsewhere. This is the more serious if the thrombus is septic. Absorption of the thrombus may be slow, in which event the limb will persist in its swollen, painful condition for weeks or months. It is rare that the condition remains permanent.

The treatment is directed toward the absorption of the clot and the prevention of embolism. The patient should remain in the recumbent position for two weeks after the temperature has subsided to normal, the leg is elevated on pillows to an angle of about 30 degrees, the limb is loosely wrapped in cotton, and all massage interdicted. After the expiration of several weeks gentle massage should be practised. At the onset of the affection ice-bags may be placed along the course of the vein, and lotions of lead water and laudanum applied twice daily, but without rubbing.

Acute Dilatation of the Stomach.—This is a more frequent complication than is generally known.

Nothing definite is known as to the cause. Postoperative adhesions may obstruct the pyloris and induce distention of the stomach. Compression from tampons and drainage tubes may so compress the pyloris as to bring about distention of the stomach. It is observed that in cases in which the stomach is in a state of chronic distention or inflammation further distention is more liable to occur.

When no adhesions or evident cause of compression exist one is forced to accept the theory of paralysis of the stomach.

In acute dilatation of the stomach there is vomiting of large quantities of fluid, distention of the stomach with gas, and collapse. The breathing is shallow, rapid, and labored; the pulse is feeble and rapid; the temperature is not elevated, and may become subnormal; peristalsis is lacking, and there is no difficulty experienced in outlining the distended stomach unless the bowel is likewise distended.

Treatment.—The treatment is at best uncertain. Atropine, strychnine, and eserine may be given hypodermically. The stomach should be washed out early and at frequent intervals. Nourishing enemata may be given until food can be digested by the stomach. Some good may come from elevating the hips.

When there is a possible cause for compression or constriction of the pylorus an exploratory incision may be called for.

Vomiting.—It is rare that some degree of nausea and vomiting does not follow upon operations when a general anesthetic is used. The patient may have an idiosyncrasy to account for the vomiting. Neurotic individuals are particularly susceptible.

Diseases of the digestive tract, such as chronic gastritis, gastric ulcer, pyloric obstruction, and intestinal obstruction are underlying

factors. Acute peritonitis or adhesive bands in the peritoneal cavity are also to be mentioned. It is observed that vomiting is more often excessive when the stomach and bowels have not been properly emptied prior to operation. The effect of the anesthetic is upon the vomiting centre and upon the mucosa of the stomach from the saturated mucus which is swallowed.

Persistent and violent vomiting becomes a serious complication, and is indicative of grave complications, notably of ileus, dilatation of the stomach, peritonitis, and nephritis.

Management of Persistent Vomiting.—1. Elevation of the patient in the Fowler position.

2. Withholding all food by the stomach.

3. Hot-water bottle or mustard plaster applied to the epigastrium.

4. Stomach lavage.

5. Hypodermic injections of small doses of morphine ($\frac{1}{8}$ grain). It must be borne in mind that morphine will occasionally cause vomiting.

Postoperative Cystitis.—Taussig has made a careful report[1] on postoperative cystitis, of which the following is an abstract: "Two main factors are involved in the causation of this complication; the first is truma, the second infection." A third factor is mentioned, that of retention, which, as Taussig says, is not an immediate cause, inasmuch as such cases result in cystitis through the above-named factors from the use of the catheter.

Traumatism of the bladder, either directly inflicted or by stripping the bladder from the uterus or ligating bloodvessels which lead to the uterus, are potent factors in the development of postoperative cystitis. In Wertheim's radical abdominal operation for cancer of the uterus where trauma of the bladder is extreme, cystitis developed in 64 per cent. of the cases of Taussig. This in contrast with vaginal hysterectomy, in which but 2 per cent. of the cases suffered postoperative cystitis.

Infection may exist prior to the operation; it may be introduced at the time of operation or subsequent to the operation.

Spontaneous infection through the urethra, or by way of the blood and lymph streams, is possible, though its proof is not conclusive. Unquestionably microörganisms of low vitality existing in the urethra may find their way to the bladder, the resistance of whose tissues is greatly lowered, and thereby permits of pronounced infection.

The disinfection of the urethra is impossible, hence the passage of catheter and sounds endangers the bladder.

The *prevention of postoperative cystitis* is under our control only to a certain degree, since it is not always possible, in operating, to prevent injury to the bladder, and the use of the catheter is often imperative, hence the impossibility of altogether avoiding infection of the bladder.

[1] Surgery, Gynecology, and Obstetrics, February, 1906.

The *prevention of the retention of urine* cannot be said to be wholly under the control of the surgeon, though numerous means are at our command, all of which have merit.

Werth greatly reduced the percentage of his cases of retention of urine following operation by filling the bladder with normal salt solution. Before adopting this practice his percentage was 55, afterward it was reduced to 9.7, and postoperative cystitis was reduced in frequency from 11 to 2.9 per cent.

Baisch recommends the injection of 20 c.c. of a 2 per cent. boroglycerin solution into the bladder and claims universal success in the method, though Frankenstein claims to have failed in 50 per cent. of his cases in which this method was tried.

Unquestionably the sitting posture greatly facilitates the act of urination, and should be enforced whenever there is retention, provided the condition of the patient will permit.

The retention catheter should not be employed except in exceptional cases, such as following operations upon urinary fistulæ.

The author has employed, with a large degree of success, the injection of 2 drops of spirits of camphor into the urethra, using a sterile medicine dropper. No pain is caused by the injection if the solution does not come in contact with the vulvar surface. The urine will usually be voided within three minutes following the injection.

Trauma is produced by rough handling of the bladder in pelvic operations, hence the necessity of avoiding all possible injury to the bladder, which might lead to cystitis and retention of urine. All raw surfaces created on the bladder should be carefully covered with peritoneum so far as possible.

Infection should be prevented by exercising every possible precaution in the sterilizing of catheters, hands, and field of operation. With every possible precaution exercised there is still the possibility of infection produced by the passage of a sterile catheter through the urethra, which at all times contains microörganisms. Hence the advisability of restricting the use of the catheter by encouraging spontaneous evacuations of the bladder.

After the germs have gained entrance to the bladder it may still be possible to make way with them before they have produced an inflammatory reaction. A certain degree of antiseptic quality is given the urine by the internal administration of 5 to 7 grains of urotropin, four times daily, until the urine becomes acid in reaction. Only mild forms of infection are controlled by such medication; severe forms are little or not at all affected.

The irrigation of the bladder with a 3 per cent. boric acid solution, if frequently repeated and long continued, will give good results, though not all operators have been so successful as has Baisch, who introduced the method. Taussig recommends its use as the best of prophylactic measures. After the development of a severe type of cystitis which does not yield to bladder irrigations, a justifiable procedure would be to establish an artificial vesicovaginal fistula, to leave

it open until the inflammatory changes in the bladder have disappeared, then to close it.

Acute Nephritis.—Gynecological operations are seldom followed by acute nephritis unless there has been a preëxisting lesion in the kidney, infection, or intestinal obstruction. In ether anesthesia there is always the danger of acute nephritis.

Fig. 631

Vulvar douche.

The condition may be overlooked. Persistent nausea and vomiting, headaches, defective eyesight, delirium, stupor, and convulsions, all suggest the possible involvement of the kidney, and should call for a urinalysis.

The fact that the lesion may exist for a time without classical manifestations makes it imperative that the urine be examined daily after operation for the first week or ten days.

The treatment does not differ from that laid down in text-books on internal medicine for acute nephritis in general.

Traumatic Fistulæ.—Ureteral, vesical, and rectal fistulæ may be the direct or indirect result of operations upon the organs themselves or upon neighboring organs.

Ureteral Fistulæ may result from the cutting, ligating, or crushing of the ureter, or from the destruction of the periureteral circulation. The accident is especially liable to occur in the course of hysterectomy and the removal of broad ligament cysts and fibroids. (For a more detailed account of ureteral fistulæ see pages 806 and 821.)

Vesical Fistulæ.—We find the same causes for fistula of the bladder as for the ureter. In the majority of cases the bladder has been wounded in the course of a vaginal hysterectomy. Formerly, when clamps were used in this operation, the accident occasionally occurred from pressure necrosis. It happens, though rarely, that a vesical fistula develops from the opening of a pelvic abscess into the bladder. More frequently ulcerative processes in the bladder, either cancerous or tuberculous, give rise to fistulæ. (See page 807.)

Rectal Fistulæ.—The author has seen two rectal fistulæ caused by direct injury in the performance of a perineorrhaphy. More often a cancerous invasion of the rectum is the cause. (See page 804.)

Pressure Paralysis.—It occasionally happens that a leg may be paralyzed for a time from pressure while the patient is in the lithotomy position. Again, the shoulder may be involved as the result of pressure from the shoulder supports when the patient is in the Trendelenburg position.

The author knows of no case of permanent paralysis, but has seen a number of cases in which there was numbness, tingling, and loss of muscular power lasting from a day to several months.

The accident is preventable by seeing to it that no undue pressure or constriction is made by the leg-holders or shoulder-braces.

Burns.—This is a distressing accident, not only to the patient but to surgeon, nurse, and hospital management. The accident is inexcusable, in that it can be prevented if due care and diligence be exercised.

The hot-water bottles placed about the patient when she is returned to her bed should rest outside the blanket, and should be constantly guarded from coming in direct contact with the patient's body.

No round bottles should be used, because they are liable to roll underneath the blanket.

Emphysema of the Abdominal Walls.—On two occasions the author has seen a wide spreading emphysema of the abdominal walls, due to infection of the abdominal wound with the bacillus aërogenes capsulatus. Emphysema of a less significant type may be due to the entrance of air into the tissues about the incision.

Poisoning by Drugs.—*Opium* poisoning has been occasionally seen to follow operations when given in large doses by mistake. The patient falls into a deep sleep, the respirations are greatly slowed, the face cyanotic, the pupils contracted, and the throat and mouth dry.

Atropine poisoning gives the following symptoms: delirium, restlessness, dilated pupils, dryness of throat and mouth, rapid pulse and respirations, cutaneous rash, and finally stupor and coma.

Mercury poisoning may arise from the administration of calomel, from vaginal douches, and the irrigation of wounds. The secretion

of saliva is increased, the gums and teeth become sore, the breath foul, a rash appears on the skin, and there is diarrhea.

Iodoform poisoning may arise from an iodoform gauze pack when placed in the pelvis. The patient becomes uncomfortable, is restless and depressed; there is headache, dizziness, insomnia, melancholia, and delirium. There may be an unpleasant taste in the mouth, and the urine contains iodine. A rash may appear on the skin, and finally stupor may deepen into collapse.

Carbolic acid should not be employed in gynecological practice.

The *skin eruptions common to drug poisoning* are purpura, urticaria, eruptions of papules, vesicles and pustules, and erythema. The drugs causing these eruptions are quinine, copaiba, arsenic, mercury, iodides, ergot, belladonna, opium, bromides, turpentine, chloral, carbolic acid, etc.

Infectious and Contagious Diseases.—*Typhoid fever* occasionally follows upon a gynecological operation. The author has had one such experience after removing an ovarian cyst.

Malaria may also follow upon gynecological operations. The surgeon must not be hasty in arriving at the conclusion that malaria or typhoid fever is present, but must bear in mind the greater possibility of a wound infection.

Diarrhea.—In uremia and sepsis diarrhea is a not uncommon accompaniment. More often improper feeding brings on a gastro-enteritis. Diarrhea associated with a general peritonitis is occasionally observed. Poisoning by drugs, notably mercury, will explain a certain number of cases.

So far as possible the cause should be sought and removed. The usual remedies may be given, *i. e.*, bismuth, opium, etc.

Bed-sores.—In patients greatly debilitated from disease, and who are confined to their bed for a long period of time, bed-sores are liable to form, and the utmost care must be exercised in preventing their development.

To prevent the development of bed-sores the skin of the patient must be kept clean and dry. She must be shifted from one position to another, and the bandages must be applied smoothly. An air-cushion will aid much in protecting an area which gives the appearance of necrosis of the soft parts. The skin may be toughened by frequent bathing with dilute alcohol.

When the ulcers have formed they are to be kept clean by frequent bathing in a mild antiseptic; a dusting powder of bismuth, calomel, or boric acid should be used freely, and the ulcer protected by a dressing of sterile absorbent cotton.

Acid Intoxication.—Little definite knowledge is obtainable on the subject of acid intoxication. We know of its presence in cases of diabetes, and we are told that it exists in carcinoma and anemia. It may exist without assignable cause. When following upon operations the following symptoms are recorded by Miller: Acetone odor to the breath, apathy, distaste for food, vomiting, presence of acetone and diacetic acid in the urine.

Ophthalmia.—Shortly after operation an ophthalmia occasionally develops. The usual cause is irritation from chloroform or ether. At other times the vomitus may infect the eye. The habit of trying the pupil reflex by touching the cornea may lead to injury to the eye. A cold compress should be placed over the eyes during the anesthetic. When pus is present no time should be lost in testing for the presence of gonococci.

When ophthalmia develops a mild astringent should be applied and the eye irrigated with a boric acid solution.

Late Chloroform and Ether Poisoning.—Similar effects to phosphorus poisoning have been observed upon the liver, heart, and kidney cells as a late result of chloroform and ether anesthesia. Fatty degeneration and necrosis are the usual findings.

Bevan and Favill record most serious effects upon the liver. The symptoms caused thereby are vomiting, delirium, coma, convulsions, Cheyne-Stokes respiration, icterus, cyanosis, acetonemia, and acetonuria, and finally death may ensue. The onset of these symptoms may be in less than a day or as late as the sixth day.

Irregularities of the Pulse.—We find in the pulse a reliable guide to the general condition. It therefore deserves careful observation during the critical period of convalescence.

Prior to the operation a record should be made, not alone of the pulse-rate, but of the quality as well, for the purpose of comparison subsequent to operation, otherwise undue alarm may be occasioned by an irregular heart action or one of unusual quality when observed for the first time after operation, not knowing that such was the condition prior to operation.

The rate of pulse is not so good an indication as the volume and rhythm. An increasing pulse-rate is always alarming, and particularly so when associated with a decreasing volume and irregularities in the rhythm. The nurse may take the pulse at a time when the patient is disturbed from vomiting, pain, and movements of the bowels without recording the incident, thereby leading to a false interpretation.

Excessive Pain.—What is pain to one individual may not be pain to another; in other words, there is a great variability in the susceptibility to pain in individuals. We must, therefore, have regard to the psychic element in our cases.

It is the author's practice not to permit the suffering of great pain following operations for want of an anodyne. Distress and loss of sleep far outweigh the harmful effects of anodynes judiciously administered. His preference is for heroin, $\frac{1}{12}$ grain, or codeine, $\frac{1}{2}$ grain hypodermically, and when these fail the sulphate of morphine, $\frac{1}{8}$ to $\frac{1}{4}$ grain, must be substituted. The effort must be made to determine the cause of the pain and to remove it. The ice-bag applied over the seat of pain will usually serve the purpose. Gas pains are best controlled by elevating the body of the patient on pillows, by the administration of eserin, $\frac{1}{50}$ gram, and by the judicious employment of enemata.

Variations in Body Temperature.—As with the pulse, so with the temperature, there are not only great variations during the period of convalescence as the result of evident causes, but such variations may occur in the absence of a demonstrable cause. Immediately following a prolonged operation the temperature may drop a fraction of a degree below the normal, as indeed it may do at any time in the period of convalescence. On the other hand, beginning with a few hours after operation and continuing for hours and possibly days, the temperature may rise to 1° or 2° above normal. When the temperature rises more than 1° above the normal and persists for two or more days, the author believes that some infection exists, whether it can be demonstrated or not. A low grade of infection may exist in the peritoneal cavity or in the line of incision without giving rise to local manifestations.

When the pulse becomes feeble and rapid and the temperature falls below the normal one is liable to suspect hemorrhage; *per contra*, when the pulse increases in rate and volume and the temperature rises there is probability of infection.

Secondary Hemorrhage.—In the early days of abdominal surgery secondary hemorrhage was a not uncommon accident, but with improved technic there is little liability to such an event.

The accident is liable to arise when a defective knot is made, when too much tissue is incorporated in the ligature, when the ligature is cut too close to the knot, when raw surfaces are left uncovered in the pelvis and elsewhere, and when infection follows quickly upon the operation.

All these conditions are largely eliminated by a careful surgeon, and hence secondary hemorrhages in pelvic operations are scarcely to be feared. And yet the accident may occur in the hands of the most painstaking of surgeons.

Catgut left in the abdomen may soften and swell; in this way an ordinary square knot may be loosened and give way. The shrinking of vascular and edematous tissues included in the ligatures loosens the knot, hence the rule that as little tissue as possible should be included in the ligature.

The careful covering of all raw surfaces by peritoneum will eliminate the danger of capillary oozing when adhesions have been separated from peritoneal surfaces. When found impossible to cover such raw surfaces with peritoneum the application of the actual cautery at a dull glow will provide an acceptable substitute.

With the patient in the Trendelenburg position all bleeding vessels and oozing surfaces may appear controlled, but with the resumption of the horizontal position the bleeding may start afresh; hence the rule that in cases in which there is liability to hemorrhage, the incision should not be closed until the patient is placed in the horizontal position and the field of operation carefully inspected. The inspection should be so deliberate and thorough as to leave no possible doubt as to the security of the hemostasis.

In dealing with large bloodvessels the author is in the habit of using

two No. 2 plain catgut ligatures, thus providing double security. A better security is provided by the use of silk, or linen ligatures to large bloodvessels.

Tissues to be ligated should not be placed on the stretch, and when ligating close to a clamp, the clamp should be removed as the knot is tied.

When operating in the presence of troublesome capillary oozing which cannot be secured by ligatures, time will be saved by packing a hot sterile pad down upon the oozing surface. This may be left until the end of the operation, and when removed the oozing will usually be found to be controlled. If this does not suffice for the control of the oozing blood, a transverse incision should be made into the vagina through the cul-de-sac and the end of a long strip of plain or iodoform gauze passed into the vagina, and the remainder of the strip packed into the pelvis and made to firmly press upon the oozing surfaces. For this purpose the author uses a roll of gauze made of four plies, five inches wide and three to five yards long. The abdomen can then be closed with sutures and two to four days later the gauze is removed by way of the vagina.

When it is impossible or hazardous to cut into the vagina from above, a Mikulicz drain may be substituted and brought out through the lower end of the abdominal incision.

The rapidity with which symptoms of hemorrhage present depends directly upon the amount of blood lost on the one hand, and the previous condition of the patient on the other.

There need be little fear of a fatal hemorrhage from an oozing surface; the danger is that the escaped blood may become infected, thereby creating a localized abscess and subsequent adhesions.

Death may ensue within a few minutes from hemorrhage when the ovarian or uterine arteries are not secured by ligatures. When the bloodvessels are abnormally large, as is often the case in uterine fibroids, double ligatures should be placed about the largest vessels.

The following are the *symptoms suggestive of internal hemorrhage:*

1. Faintness and dizziness.
2. Restlessness.
3. Increasing pallor.
4. Quickened, sighing respirations.
5. Increasingly rapid pulse with diminishing volume.
6. Surface of body cold and clammy.
7. Paroxysmal abdominal pain—may be severe.
8. Occasional vomiting.
9. Increasing dyspnea.
10. Dilated pupils.
11. Unconsciousness.
12. Death may occur in from a few minutes to forty-eight hours.

It has been conclusively shown that death from hemorrhage is not directly due to the total loss of blood but to the lessened volume of blood in the vessels which embarrasses the heart action. Herein lies

the value of normal salt solution as a remedial agent in such cases. By adding to the volume of the blood and by the stimulating influence of the sodium chloride, the heart is stimulated and the blood tension is increased. In view of the heightened blood tension produced by normal salt solution it is dangerous to employ hypodermoclysis prior to the securing of the bloodvessels.

While it is to be desired that everything shall be prepared in strict accord with surgical cleanliness, it must be borne in mind that the great need is to save the life of the patient, and to this end there must be no delay over the refinement of the preparation. A hypodermic injection of morphine, $\frac{1}{6}$ grain, should precede the hypodermoclysis.

If possible the patient should be taken to the operating room. No anesthetic, as a rule, need be given, and at most only enough to bewilder the senses of the patient to make her less sensitive to pain.

After removing the stitches and exposing the pelvic cavity to view by means of retractors, the blood is carefully but hurriedly removed by sponges, and the vessels are clamped and securely ligated.

The abdomen should then be filled with sterile normal salt solution at a temperature of 110° F. The abdomen is closed with through-and-through silk or silkworm-gut sutures. If any doubt exists as to the control of bleeding-points a gauze drain should be inserted.

Every precaution should be taken to prevent further shock. The room should be at a temperature of 80° F., the patient wrapped in warm blankets, a hypodermic of $\frac{1}{20}$ grain of strychnine should be given before leaving the operating room, and if no salt solution has been placed in the abdomen, a pint of normal salt solution and two ounces of whisky should be injected into the bowel while the patient is yet on the operating table.

When the patient has been returned to her room the foot of the bed should be elevated eight or ten inches, hot-water bottles should be placed about her; she must be wrapped in warm blankets, $\frac{1}{30}$ grain strychnine should be given every two hours during the period of great depression, after which the intervals may be gradually lengthened and the amount decreased.

When there is extreme depression a subcutaneous injection of a pint of normal salt solution should be given three or four times in twenty-four hours.

Following the immediate danger from hemorrhage and throughout the period of convalescence, every possible effort should be made to restore the quality and quantity of blood. The patient should be enjoined to rest in bed and to take the maximum amount of nourishment. Tonics should be administered. The author's preference is for Blaud's pill, grain ij, together with Fowler's solution, minims iv to vij, given after meals. General massage and fresh air will contribute to the upbuilding of the patient.

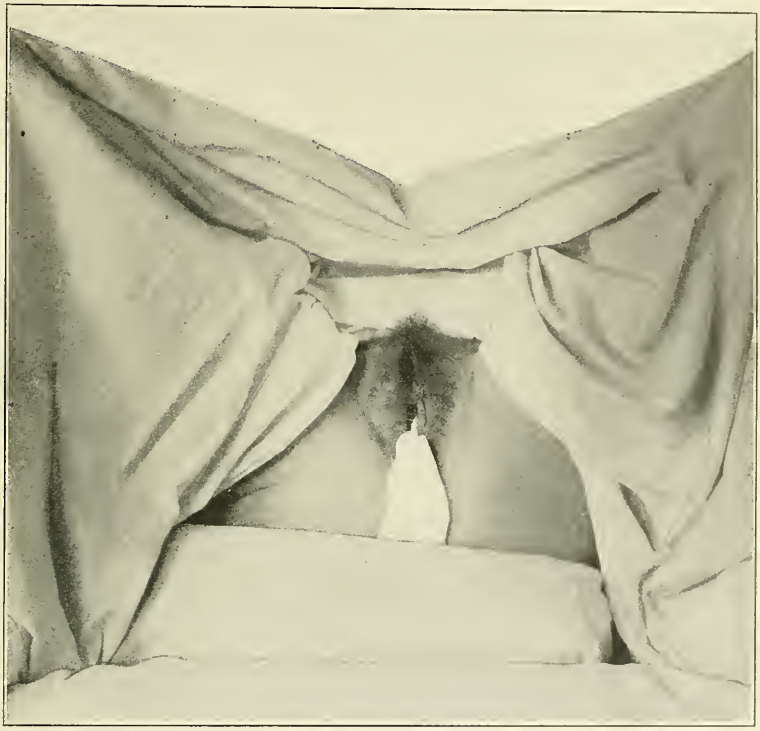
Foreign Bodies Left in the Abdominal Cavity after Operation.—It matters not how confident the operator may feel in his safeguards, he

can never rid himself of the feeling of uncertainty as to the possibility of leaving a sponge or an instrument in the abdominal cavity.

In reviewing the literature and in talking with surgeons, one is impressed with the great diversity of precautionary measures, and yet it is doubtful if any is infallible.

It is usually in the difficult cases, requiring a great number of sponges, that the accident occurs, and it is in just such cases that any routine practice may miscarry.

FIG. 632



All gauze used as a vaginal pack should be left protruding from the vulvar outlet. This will prevent the leaving of gauze in the vagina.

MacLaren observes that in these later days, when gauze sponges have replaced sea sponges, the mortality of these cases is much lessened. He has knowledge of ten cases where sea sponges were left in the abdominal cavity, and in nine of this number, death ensued from general suppurative peritonitis; in the tenth case there was a localized abscess formation.

It is of interest to note the various safeguards adopted by surgeons. Colmann recommends that the compresses have a tape attached to the free end that is long enough to tie to the leg of the operating-table, and after using they are to be dropped to the floor.

Fisher[1] proposes a linen tape, three or four feet in length, armed at one end with a needle, by which the compresses are transfixed on the tape. A piece of lead weighing a half-pound is attached to each pad to prevent the pads from being lost among the coils of bowel.

Gruzdew, at the completion of the operation, irrigates the abdominal cavity with sterile normal salt solution, and then passes his hand over all parts of the viscera in search for sponges and instruments.

Fritsch sews on each compress a long black thread which hangs out of the wound and over the side of the operating table.

Kruitchmann marks his sponges in Roman and Arabic numerals and in letters as follows: I, II, III, IV; 1, 2, 3, 4; a, b, c, d. After using the sponges are placed on the floor by a nurse in the order as marked.

Mikulicz attaches a long thread to each compress, and on the end of the thread he strings a glass ball, which hangs over the side of the operating table.

Rossel attaches to each compress a tape 20 cm. long, at the end of which is a sinker weighing three grams.

The author's method is as follows: Three sizes of gauze sponges and compresses are used; one roll five yards long and four inches wide and six plies in thickness; second, one compress one yard long, eight inches wide, and three plies in thickness; third, tufts of gauze so made as to infold all edges to prevent loose threads or layers of gauze from rubbing off on the viscera. To the free ends of the rolls and compresses is sewed a tape twelve inches in length, and to this tape is attached an artery clamp. From the time the abdomen is opened to its closure no sponge is handed the operator or assistant without a sponge-holder in the form of a long clamp.

Before sterilizing the rolls, compresses, and sponges, they are counted three times by two nurses, then wrapped in towels and the number marked on the wrapper with indelible ink.

Before these sponges are removed from their wrappers all loose sponges about the operating room are removed. The sponges and compresses to be used in the operation are then counted by the clean nurse and the assistant. This count is made separately to avoid the possibility of error, and the number is then placed on a slate. If additional sponges are required in the course of the operation they are to be counted and added to the number on the slate.

The soiled sponges and compresses are thrown into a receptacle, from which they are taken by the nurse in attendance and arranged in parallel rows on the floor in order that the count may be facilitated at the close of the operation. While closing the peritoneum, the assistant and clean nurse count the sponges and compresses, and if the number corresponds with that on the slate the wound is closed; if not, search must be made for the missing sponge. The clamps, forceps, and scissors are also counted prior to the opening of the abdomen and before the incision is closed.

[1] Annals of Surgery, 1908.

In performing abdominal sections in private homes, where it is difficult to enforce the usual safeguards, the author has adopted the suggestion of Crossen and Wakefield in doing away with all loose sponges and small pads by sewing the end of a ten-yard roll of gauze into a pocket made in the laparotomy sheet at the side of the opening over the abdomen. This roll of gauze serves the purpose of sponges and pads and obviates all danger of leaving the gauze in the abdominal cavity.

The question may arise, How can we prevent litigation in such cases? Unquestionably the prophylactic measures of exercising every possible precaution is of the greatest value. For the operator to demand a release on the part of the patient before operating is a confession of weakness, and has no practical value.

Kossmann advocates starting a counter-suit for libel in the expectation that the prosecution will retract.

Schauta says that every suit brought against a surgeon for the leaving of a foreign body in the abdomen is equivalent to conviction, because the surgeon is discredited in the eyes of the public.

Richardson says he has on several occasions found foreign bodies in the abdomen left there by other surgeons, but in no instance has the occurrence been made known to the detriment of the operator.

It is hoped that all surgeons will be equally charitable, if for no other reason than that we are all liable to become the victims of this grievous error.

INDEX

A

Abdomen, constriction of, 237
examination of, 91
exploratory incision of, 132
ice applications to, 893
operation on, preparation for, 242
pendulous, 59
support of, by corsets, 239, 244
Abdominal examinations, 91
auscultation in, 99
inspection in, 91
mensuration in, 99
palpation in, 93
percussion in, 97
pad applied after operation, 887
support, 896
in cystocele, 293
Abdominovaginal examination, 107
rectal examination, 115
Abortion, in retroversioflexion, 357
tubal, 152, 153
Abscess, Bartholinean, 401
of lungs, following operations, 908
of ovary, 489, 761
chronic, 483
cystic degeneration, 484
of pelvis, 510–516
in tubal pregnancy, 152
of uterus, 438
Absence of Fallopian tubes, 286
of ovaries, 286
of uterus, 276
of vagina, 270
of vulva, 260
Accessary ovary, causing menstruation, 26
Actinomycosis, of Fallopian tubes, 466
Adenocarcinoma, uteri, 650
Adenofibromyoma uteri, 585
peritoneal, 506
of prepuce, 265
Adipocere, 154
Adiposity, associated with amenorrhea, 39
Alcoholism, causing sterility, 69
Alexander Adams' operation, 378
Allantoic cyst from ovarian tumors, 729
Amenorrhea, 37
absence of menstruation, physiological, 37
absolute, 37
causes of general, 37
Amenorrhea, causes of, local, 39
diagnosis of, 40
functional, 41
infectious diseases and, 38
menstrual molimina and, 40
relative, 37
treatment of, 41
temporary, 38
vicarious menstruation, 40
without apparent cause, 39
Ampullar tubal pregnancy, 147
Amputation of cervix, 298
Martin's, 796
Schroeder's, 795
of tubes, 478
of uterus in inversion, 344
Amyloid degeneration of uterine fibroids, 589
Anatomy of bladder, 825
of cellular tissue of pelvis, 510
of Fallopian tubes, 382
of hymen, 267
of menstruating uterus, 24
of ovaries, 384
of ureters, 869
of urethra, 825
of uterus, 305
of vagina, 288
of vulva, 264
Anemia, 83
causing sterility, 69
uterine hemorrhage, 27
Anesthesia, choice of, 246
general, 248
local, 247
resuscitation in, 249
signs of, 248
Anesthetizer, 248
Angioma vulvæ, 393
Anomalies of genital organs, 262
of ovaries, 286
of tubes, 286
of uterus, 276
of vagina, 270
of vulva, 263
Anteflexion of uterus, 347
Anteposition of uterus, 309
Anterior colporrhaphy, 294
Anteversion of uterus, 345
Antitoxin of diphtheria, 227
Appendicitis, differentiated from ectopic pregnancy, 162
from sactosalpinx, 459

Arteriosclerosis of uterus, cause of hemorrhage, 30
Arthritis, cause of backache, 58
Artificial vagina, 272
Ascites, differentiated from ovarian cyst, 725
Asepsis in gynecology, principles of, 252
disinfection of hands and forearms, 252
operating bag, 260
preparation of gauze and sutures, 255
of instruments, 256
of operating room, 257
in home, 258
of surgical utensils, 254
sterilization of field of operation, 244
sterilized water, 257
Atony of uterine supports, massage in, 216
Atrophy of fibroids of uterus, 587
of ovary, 550
of uterus, 549
of vagina, 549
of vulva, 546
Atresia, causing amenorrhea, 39
of vagina, 272
of vulva, 262
Auscultation of abdomen in extra-uterine pregnancy, 156

B

Backache, 56
causes of, 56
arthritis, 58
coccygodynia, 58
traumatisms, 58
uterine disorders, 58
mobility of sacro-iliac joint in, 57
static, 57
treatment of, 58
Bacteriological examinations, 84
of Fallopian tubes, 87
of normal genital tract, 84, 389
of ovary, 88
of pelvic cellular tissue, 89
of peritoneum, 89
of uterus, 86
of vagina, 85
of vulva, 85
Bacteriology of normal genital tract, 84, 389
Bag, hydrostatic, 414
operating, 260
Baldy operation for prolapsus uteri, 331
Baldy-Webster operation on round ligaments, 371
Bardeen CO_2 freezing microtome, 95
Bartholinean glands, abscess of, 401, 402, 521, 524
anatomy of, 402
cancer of, 564
cysts of, 401, 521, 524
Bartholinean glands, gonorrhea of, 521, 524
inflammation of, 401, 402, 521, 524
Bartholinitis, gonorrheal, 401, 521, 524
Baths, 189
duration of, 190
during menstruation, 195
position of patient in, 190
public, 230
rest and friction after, 190
temperature of, 190
time of taking, 190
varieties of, 191
cold tub bath, 194
full tub bath, 193
half bath, 192
Nauheim bath, 195
Russian bath, 195
sea bath, 194
shower, 191
sitz bath, 194
Turkish bath, 195
Bathing during menstruation, 195
therapeutics of, 196
Bicornate uterus, 282
Bilateral tubal pregnancy, 145
Birth of uterine fibroid, 593
Bladder, anatomy of, 825
cystoscopic appearance, 833
anomalies of, 852
calculus of, 855
catheterizing of, 891
curettage of, 864
cystoscopy, 830
distended from ovarian cyst, 723
double, 853
emptying of, after operation, 891
examination of, 829
digital, 830
fissures of, 852
fistula of, 807
foreign bodies in, 855
hemispheres of, 828
hernia of, 855
hyperemia of, 864
inflammations of, 857
inspection of, through cystoscope, 830
landmarks in, 833
loculate, 853
malpositions of, 853
physiology of, 827
topography of, 827
tuberculosis of, 860
tumors of, 864
Blasen mole, 177
Blind pouches of vagina, 276
Blood, effect of uterine fibroids on, 604
examinations of, 78, 242
anemia, 83
differential count, 82
leucocytosis, 80
inflammatory, 81
in malignancy, 82
morphology of blood cells, 79

Blood, examinations of, leucocytosis, in ovarian tumors, 82
posthemorrhagic, 80
of pregnancy, 80
postpartum, 80
red cells, 78
white cells, 79
normal, 78
Body of uterus, cancer of, 638
fibroids of, 582
sarcoma of, 695
Bowels, care of, after operation, 893
Breaking of stitches, 911
Broad ligaments, cancer of, 699
cysts of, 718
fibroids of, 629, 699
sarcoma of, 69
varicocele of, 517
Bronchitis following operations, 907
Byrne method of treatment of cancer of cervix, 660

C

Calculus of bladder, 855
of ureter, 881
Cancer of Bartholinean glands, 564
of broad ligaments, 699
of Fallopian tubes, 701
of ovarian ligaments, 699
of ovaries, 712
of round ligaments, 700
of urethra, 851
of uterus, 632
acute, 640
anatomy of, 634
associated with fibroid tumors, 633
body of, treatment of, 677
cachexia in, 641
catheterizing after operation, 892
causing hemorrhage, 29
of cervix, 634
complicating pregnancy, treatment of, 676
inoperable, treatment of, 677
chronic, 640
complicating pregnancy, 676
diagnosis of, 641
clinical, 639
differential, 651
extension of, 655
macroscopic, 641
microscopic, 644
etiology of, 632
extension of, to surrounding parts, 647
leucorrhea in, 641
pain in, 641
topographical classification of, 632
treatment of, 660
Byrne method, 660
Cancer of uterus, treatment of, radical abdominal operation, 665
Schuchardt operation, 662
simple vaginal hysterectomy, 660
x-rays in, 223
of vagina, 570
of vulva, 562
Cancerous degeneration of fibroids of uterus, 591
ulcers of cervix, 634
Cantharides plaster, 211
Cardiopathy in uterine fibroids, 602
Caruncle, urethral, 851
Catarrh of cervix, 415
Catarrhal salpingitis, 447
acute, 448
anatomical diagnosis of, 448
chronic, 448
etiology of, 447
hydrosalpinx, 449
salpingitis isthmica nodosa, 449
vaginitis, 407
vulvitis, 397
Catching cold, cause of amenorrhea, 38
Catheterization of bladder, 891
of ureters, 874
Cauliflower cancer of cervix, 634
Celiotomy, vaginal, 614
Celloidin sections, 137
Cellulitis. *See* Pelvic cellulitis, 510
Cervical endometritis, 415
Cervix, amputation of, 298, 795
anatomy of, 305
cancer of, 634, 636
catarrh of, 415
dilatation of, in anteflexion, 349
ectropion of, 419
erosions of, 416
fibroids of, 583
fistula of, 818
follicular degeneration of, 417
hemorrhage from, 23
hypertrophy of, 553
inflammations of, 415
lacerations of, 795
sarcoma of, 694
technic of excising piece of, for examination, 134
tuberculosis of, 420, 541
ulcers of, 420
cancerous, 634, 644
decubitus, 420
tuberculous, 420, 541
wounds of, 793
Change in environment causing amenorrhea, 38
Childbirths, in case taking, 21
Children, gonorrhea in, 536
Chloroform anesthesia, 250
Chlorosis, causing amenorrhea, 41
Chorioepithelioma malignum, 174
causing uterine hemorrhage, 29
clinical diagnosis of, 175
etiology of, 174
macroscopic appearance of, 176

Chorioepithelioma malignum, malignant degeneration of hydatid mole, 177
microscopic appearance of, 176
primary, outside the placental site, 182
histogenesis of, 184
diagnosis of, 185
treatment of, 186
of vagina, 574
Circular amputation of cervix, 796
Circulatory disturbances in Fallopian tubes, 445
causes of, 445
diagnosis of, anatomical, 445
clinical, 446
treatment of, 467
in ovary, 480
in pelvis, causes of. *See* Pelvic infections, 589
of vulva, 393
edema, 396
gangrene, 396
hematoma, 395
noma pudendi, 397
varicose veins (angioma vulvæ), 393
Climacterium, influence on fibroids of uterus, 576
Clitoris, absence of, 264
adhesions of, 265
atrophy of, 264
cancer of, 562
hypertrophy of, 264, 553
Coccygodynia, 58
Cold tub bath, 194
Cohnheim's theory, 633
Colpitis, 406
Colpoperineorrhaphy, 763
after-treatment of, 788
external superficial tear, 763
internal and combined tears, 765
late repair of complete tear, 782
relaxation of pelvic floor, 786
repair of sphincter ani, 786
Colporrhaphy, 763
anterior, 294
Combined gynecological operations, 250
Complications following operations, 897
Conception, condition essential to, 67
Condyloma acuminata, 411, 552
Condylomatous vaginitis, 409
Congenital absence of sexual organs, causing amenorrhea, 39
Congestion, pelvic, 389
Consanguinity, causing sterility, 69
Conservative operations on ovaries, 753
Constipation, cause of circulatory pelvic disorders, 391, 393
Contracted uterine ligaments, massage in, 216
Convalescence, duration of, 894
Corpus luteum, 77
Corpus luteum, abscess of, 489
cysts of, 703
extract of, 228
Corsets, 239
Counter-irritation, 211
cantharides plaster in, 211
mustard plaster in, 211
Curet. *See* Uterine curet.
Curettage, 126
of bladder, 864
in chronic metritis, 436
in diagnosis, 134
in inoperable cancer of cervix, 677
in puerperal infection, 436
Cystadenoma pseudomucosum, 708, 711
serosum, 708, 712
Cystic degeneration of ovaries, 30, 484, 757
of uterine fibroids, 590
new formations of Fallopian tubes, 701
Cystitis, 857
following operations for cancer of cervix, 671
gonorrheal, 524
treatment of, 861
tuberculous, 860
Cystocele, 388
anatomy of, 288
differential diagnosis of, 290
etiology of, 288
prognosis of, 291
symptoms of, 299
treatment of, 291
Cystoscopic appearance of normal bladder, 833
Cystoscopy, 830
Cysts, allantoic, differentiated from ovarian, 729
of Bartholinean glands, 401, 421, 424
of broad ligaments, 718
chylous, differentiated from ovarian tumors, 729
of corpus luteum, 703
dermoid of Fallopian tube, 701
of ovary, 714
of vulva, 560
echinococcus, differentiated from ovarian cysts, 724
of Fallopian tube, 702
hydatid of Morgagni, 703
of hymen, 269, 56
of labia minora, 559
of ovary, 703–714
simple, 703
pancreatic, differentiated from ovarian cysts, 728
parovarian, 718, 724
tuboövarian, 703
of vagina, 567
of vulva, 560
sebaceous, 559

D

Debilitating diseases causing amenorrhea, 37

Decidua, of extra-uterine pregnancy, 142, 655
of menstruation, 142
of uterine pregnancy, 142
Decidual endometritis, 424
Deciduoma malignum, 174. *See* Chorio-epithelioma malignum.
Decubitus ulcers of cervix, 651
of vagina, 573
Degenerations of fibroids of uterus, 586
amyloid, 589
atrophy of, 587
calcareous, 588
cancerous, 591
cystic, 590
fatty, 588
gangrenous, 589
myxomatous, 589
sarcomatous, 591
suppuration, 589
telangiectatic, 589
Delayed menopause, 74
Dermoid cysts of Fallopian tubes, 701
of ovary, 714
of vulva, 560
Descensus ovarii, 386
uteri, 315
vaginæ, 317
Development of genital organs, 263
of uterus, 307
Diastasis recti, 59
Diet, general, 251
liquid, 251
soft, 251
Digital examination of bladder, 830
of internal genitals, 100
Dilatation of cervix in anteflexion, 349
of urethra, 844
Diphtheritic infection of vulva, 399, 400
Disinfection of hands, 252
Displacements of genital organs, 288
causes of circulatory disturbances, 393
of pelvic inflammation, 393
Displacements of Fallopian tubes, 382
ovaries, 384
uterus, 305, 317
vagina, 317
Diverticula of Fallopian tubes, 286
Double cervix, 286
uterus, 286
vagina, 275
vulva, 262–263
Douche in chronic metritis, 439
intra-uterine, 200
vaginal, 196
Drainage of pelvic abscess, 516
by tampons, 214
Dress, 237
Dropsy of chorionic villi, 177
Drinking water, 208
Drug addiction, causing amenorrhea, 38
Ductless glands, 227
disordered functions of, 39
Dudley operation for anteflexion, 351
Dysmenorrhea, 41
causes of, 42
conical cervix, 56
dilatation of cervix in, 51
membranous, 45
nasal, 46
ovariotomy in, 54
periodic intermenstrual, 47
primary, 42
in retroversioflexion, 357
secondary, 43
stem pessaries in, 54
treatment of, 45
medical, 49
surgical, 51
Dyspareunia, causing sterility, 69

E

Echinococcus cysts from ovarian cysts, 724
Ectopic pregnancy, 143. *See* Extra-uterine pregnancy.
Ectropion of cervix, 419
Eczema, *x*-rays in treatment of, 224
Edema of vulva, 396
Electricity, 223
Elephantiasis vulvæ, 551
Elevatio uteri, 313
Embolism in fibroids of uterus, 604
pulmonary, 902
simulating surgical shock, 899
Emmet's perineorrhaphy, 774
Emphysema vaginæ, 408
Endocervicitis, 415
treatment of, 442
Enchondroma of ovary, 716
of vulva, 559
Endometritis, cervicalis, 415
classification of, anatomical, 425
fungous, 426
glandular, 427
hypertrophic, 426
interstitial, 431
macroscopic, 426
microscopic, 427
polypoid, 426
pseudodiphtheritic, 426
ulcerative, 426
villous, 426
clinical, 421
acute, 421
catarrhal, 422
chronic, 422
decidual, 424
dysmenorrheic, 425
exfoliative, 140, 424
gonorrheal, 423
hemorrhagic, 422
postabortive, 424
puerperal, 424
senile, 425
tuberculous, 423
curet used in, 126

Endometritis, diagnosis of scrapings in, 427, 431
treatment of, 442
uterine hemorrhage and, 28
Endometrium, myometrium, tubes and ovaries in uterine fibroids, 591
Endothelioma of ovary, 717
of uterus, 692
of vagina, 574
Enteroclysis, 203
Enteroptosis, 59
Enterovaginal fistula, 806
Epispadias, 265
Erosions of cervix, 416
differentiated from cancer, 651
Erysipelatous vulvitis, 398
Eversion of cervix, 416
differentiated from cancer, 651
treatment of, 444
Examinations of external and internal genitalia, 100
abdominovaginal, 107
combined vaginal, 106
digital, of internal genitals, 100
of rectum, 112
of vagina, 100
inspection of external genitals, 100
palpation of ureters through vagina, 112
pelvimeter, 117
physical, 90
auscultation, 99
inspection, 91
mensuration, 99
palpation, 93
percussion, 97
preliminary measures, 90
Exercise, indoor, 230
Exfoliative endometritis, 140
Expelled membranes from uterus, 142
decidua of extra-uterine pregnancy, 142
of menstruation, 142
of uterine pregnancy, 142
diagnosis of, 140
examination of, macroscopic, 141
microscopic, 141
exfoliative endometritis (membranous dysmenorrhea), 140
Exploratory incisions in ectopic pregnancy, 158
puncture of ectopic pregnancy, 158
and incisions, 132
Extended vaginal operation for cancer of cervix, 662
Extension of cancer of uterus, 655
External genitals, inspection of, 100
Extra-uterine pregnancy, 143
anatomical changes in tube, 154
bilateral, 154
classification of, 146
Extrauterine pregnancy, classification of, ampullar, 147
infundibular, 150
interstitial, 150
ovarian, 151
diagnosis of, clinical, 155
objective signs, 156
subjective signs, 156
differential, 158
ending of gestation, 152
history of, 155
mortality of, 172
recurrent and multiple, 144
retrogressive changes in, 154
treatment of, 164
of advanced pregnancy, 170
at time of rupture, 165
of combined extra-uterine and intra-uterine pregnancy, 171
of interstitial pregnancy, 170
of intraligamentary pregnancy, 170
late after rupture, 167
of ovarian pregnancy, 171
in rudimentary horn, 170
of unruptured, 16
Exudates, parametric, 512
differentiated from paratyphlitic, 515
from perimetric, 515
from peritoneal, 506
from psoas abscess, 516
from salpingitis, 461

F

Fallopian tubes, actinomycosis of, 466
anatomy of, 382
anatomical changes in ectopic pregnancy, 154
anomalies of, 286
bacteriology of, 87
carcinoma of, 701
circulatory disturbances of, 445
cystic new formations of, 703
dermoid cyst of, 701
gonorrhea of, 454, 459, 522, 526, 534
examination of, 109
infectious granulomata of, 446, 462
inflammations of, 446
lipoma of, 701
parasites of, 466
papilloma of, 700
polyps of, 701
sarcoma of, 701
syphilis of, 466
tumors of, 700
tuberculosis of, 462, 478, 541
Family history, in case taking, 21
Fate of ovarian tumors, 736
Fatty degeneration of uterine fibroids, 588

Faulty secretions, contra-indications to operation, 243
Fecal fistula, 801
enterovaginal, 806
rectolabial, 805
rectoperitoneal, 804
rectovaginal, 801
Fermentation fever following operations, 909
Fibroids of uterus, 575
adenofibromyoma, 585
amyloid degeneration of, 589
associated with cancer, 633
atrophy of, 588
calcareous degeneration of, 588
cancerous degeneration of, 591
cardiopathy in, 602
causing uterine hemorrhage, 29
of cervix, 583, 595
in climacterium, 576
complicating pregnancy, 630
death from, 604
degenerations of, 586
cystic, 590
differentiated from cancer, 652
from chronic metritis, 597
from extra-uterine pregnancy, 161
from hematoma, 600
from ovarian cysts, 721
from pelvic exudates, 515
from pyosalpinx, 460
from retroversioflexion, 362
from uterine pregnancy, 597
effect of, on blood, 604
on neighboring organs, 604
embolism in, 604
etiology, 575
fatty degeneration of, 588
gangrene of, 589
hemorrhage in, 592, 600
imperial life, 600
interstitial, 583, 594
intestinal obstruction due to, 601
latent, 584
in menstruation, 576
myxomatous degeneration of, 589
in pregnancy, 576, 600
pressure in, 592
rate of growth of, 592
recurrence of, 584
sarcomatous degeneration of, 591, 697
septic infection of, 601
submucous, 582, 595
subserous, 594, 595
suppuration of, 589, 601
telangiectatic, 589
thrombosis in, 604
treatment of, 605, 608
x-rays in, 225
Fibroma of broad ligaments, 699
of cervix, 582
of Fallopian tubes, 701
Fibroma of ovarian ligament, 699
of ovary, 715
of round ligaments, 700
of urethra, 851
of uterus, 575
of vagina, 569
of vulva, 559
Fibromyoma of uterus, 575
adenofibromyoma, 585
clinical characteristics of, 591
complicating pregnancy, 630
degenerations of, 586
diagnosis of, anatomical, 577
clinical, 592
differential, 597
microscopic, 584
effect of neighboring organs, 604
etiology of, 575
histogenesis of, 576
operations for, 608
treatment of, 805
Fibromyxoma cystoma of fimbriæ, 701
Fistulæ of anus, 804
of bladder, 807
enterovaginal, 806
rectolabial, 805
rectoperineal, 804
rectovaginal, 804
of rectum, 804
of ureter, 876, 821
of urethra, 804
of vagina, 821
vesicocervical, 810
vesico-uterine, 810
vesicovaginal, 807
Follicular abscess of ovary, 489
cysts of ovary, 703
degeneration of ovary, 484
erosions of cervix, 417
Foreign bodies in abdomen, 930
causes of pelvic inflammation, 393
in urethra, 851
in uterus, 797
Full tub bath, 193
Furunculous vulvitis, 400

G

Gall-bladder, distended, differentiated from ovarian cysts, 729
Gangrene of fetus in ectopic pregnancy, 154
of fibroids, 589
of lungs following operations, 908
of vulva, 396
Gas anesthesia, 249
General lowered vitality, contra-indication to operation, 243
peritonitis, 493
Genital organs, development of, 263
normal secretions of, 63
Genito-urinary fistula, 806
urethral, 806
vesical, 807

Genito-urinary fistula, vesicocervical, 810
vesico-uterine, 810
vesicovaginal, 807
Gellhorn, acetone treatment of inoperable cancer, 677
Gestation, ectopic, 143. *See* Extra-uterine pregnancy.
Glass plug, Sims', 413
Gloves, rubber, 252
Gonorrhea in children, 536
in women, 520
Bartholinitis, 401, 521, 524
cause of pelvic inflammation, 392
cystitis, 522, 524, 534
diagnosis of, 522
etiology of, 520
gonococcus in, 520
location of infection in, 528
ovaritis, 522, 527, 534
peritonitis, 501, 522
prevention of, 434
prognosis of, 527
relation of, to sterility, 527
risks to offspring in, 528
salpingitis, 522, 526, 534
treatment of, 529
of urethra, 520, 523, 530
of uterus, 521, 525, 532
vaccines in, 538
vaginitis, 525, 529, 531
vulvitis, 398, 521, 524, 531
Graafian follicles, 384

H

Half tub bath, 192
Heart lesions, contra-indications in operations, 242
in uterine fibroids, 602
Heat, electrical, applied to abdomen, 210
Hematocele, differentiated from ovarian cyst, 722
in ectopic pregnancy, 167
Hematocolpos from atresia vaginæ, 272
Hematoma, causing uterine hemorrhage, 30
differentiated from fibroids of uterus, 600
of ectopic pregnancy, 167
from pelvic cellulitis, 515
of ovary, 480
of vulva, 395
Hematometra from atresia vaginæ, 272
Hematosalpinx, 450, 476
from atresia vaginæ, 272
from ectopic pregnancy, 469
from salpingitis, 450
due to twisting of tube, 462
Hemorrhage from genital tract, 22
in anemia, 27
in arteriosclerosis of uterus, 30
in cancer of uterus, 29, 640
causing surgical shock, 899
Hemorrhage from genital tract, from cervix, 23
in congestion of pelvis, 27
controlled by tampons, 211
in cystic degeneration of ovaries, 30
emotions causing, 27
in endometritis, 28
in hematoma, 30
infectious diseases causing, 27
intraperitoneal in ectopic pregnancy, 157
menstrual, 23
in menopause, 33
in mucous polyps, 28
myopathic, 30
in obstetrics, 30
into ovarian cysts, 733
parauterine inflammations, 28
passive congestion causing, 27
plethora causing, 27
in purpuric conditions, 27
in sarcoma of uterus, 29
in specific infectious diseases, 27
subinvolution, 28
in syphilis, 32
in syncytioma malignum, 29
treatment of, 33
from tube in menstruation, 26
in uterine fibroids, 29, 600
from vagina, 23
vicarious, 40
from vulva, 22
x-rays in uterine hemorrhage, 225
Hepatic colic differentiated from extra-uterine pregnancy, 163
Heredity in cancer, 633
in ovarian cysts, 706
in tuberculosis of genital organs, 539
in uterine fibroids, 575
Hernia of ovary, 388
of tube, 388
of uterus, 381
of vagina, 302, 304
Holden's perineorrhaphy, 769
Hot-air therapy, 209
contra-indications to, 209
indications for, 209
physiological action of, 209
technic of, 209
compresses, 207
pack, 210
-water bag, 207
Hydatid mole, 177
Hydatids of Morgagni, 703
Hydatidiform degeneration of chorion, 177
Hydronephrosis differentiated from ovarian cysts, 729
Hydrosalpinx, 449, 476

Hydrostatic bag, 414
Hydrotherapy, 188
baths, 189
hot compresses, 207
hot-water bag, 207
ice bag, 207
intra-uterine douche, 200
saline injections, 202
vaginal douche, 196
water drinking, 208
Hygiene of the school girl, 229
Hymen, anatomy of, 267
cysts of, 269
imperforate, 269
malformations of, 267
Hypertrophic endometritis, 426
Hypertrophy of cervix, 553
of clitoris, 264, 553
of endometrium, 426
of labia, 553
of ovary, 286, 558
of vulva, 553
Hypodermoclysis, 204
in hemorrhage, 203
massage in, 204
preparation of field for, 204
quantity, 204
in shock, 203, 888, 901
technic of, 204
temperature of solution, 204
Hypoplasia of cervix, 279
of Fallopian tubes, 286
of ovary, 287
of uterus, 279
of vagina, 272
of vulva, 264
Hypospadias, 266
Hysterectomy in arteriosclerosis of uterus 30
in bilateral pyosalpinx, 471
in cancer of uterus, 660
in chronic metritis, 442
in fibroids of uterus, 609
in inversion of uterus, 344
in perforation of uterus, 797
in prolapse of uterus, 331
in puerperal infection, 436
in sarcoma of uterus, 698
in tuberculosis of uterus, 543
Hysteromyomectomy, complications in, 627
conservation of ovaries in, 626
Kelly's modification of, 624
supravaginal, 621
vaginal, 620
Hysterocele, 381

I

Ice applications to abdomen, 893
Ileus, 903
Immunity in gonorrhea, 521
Impaction of fibroids, 601
Incarceration of fibroids, 601
massage in, 216
Incarceration, pressure therapy in, 222
Indoor exercise, 230
Infantile cervix, 279
Fallopian tubes, 286
ovaries, 287
uterus, 279
vulva, 263, 264
Infection of fetus, ectopic, 154
of fibroids of uterus, 589
of genital organs, 389
tuberculous, 539
gonorrheal, in women, 520
local, following operations, 908
of ovarian cysts, 715, 734
of pelvic hematoma, 152
Infectious diseases causing uterine hemorrhage, 27
granulomas of Fallopian tubes, 462
Inflammations of Bartholinean gland, 401
of cellular tissue of pelvis, 510
of cervix, 415
of Fallopian tubes, 446, 496
classification of, 447
granulomata, 446
treatment of, 467
conservative, 470
non-operative, 468
radical, 471
of ovaries, 483
acute, 483
of peritoneum, 493
of uterus, 420, 438. *See* Metritis.
of vagina, 406. *See* Vaginitis.
of vulva, 397. *See* Vulvitis.
Infundibular tubal pregnancy, 150
Inoperable cancer of cervix, 634
treatment of, 677
Inspection of abdomen, 91
of external genitals, 91
Instrumental and digital infections, 392
causing pelvic inflammation, 393
Instrumental examinations, 118
exploratory puncture and incision, 132
uterine curet, 126
indications for, 126
contra-indications for, 127
dangers of, 128
technic of, 129
in treatment, 130
dilators, 121
sound, 122
vaginal speculum, 118
vulsellum forceps, 120
Internal hernia differentiated from ectopic pregnancy, 163
Interstitial fibroids of uterus, 583
tubal pregnancy, 150
Intestinal colic differentiated from ectopic pregnancy, 163
obstruction in uterine fibroids, 601
Intraligamentary cysts, 718
fibroids, 629

Intraperitoneal hemorrhage in ectopic pregnancy, 157
Intra-uterine douche, 200
limitations of, 201
physiological action of, 201
technic of, 201
Intravenous injections, 205
apparatus, 206
indications for, 205
local anesthesia in, 206
quantity of, 206
technic of, 206
temperature of solution, 206
Inversion of uterus, 334
anatomy of, 336
causes of, 334
clinical diagnosis of, 337
differentiated from partially divided uterus with a depression in the fundus, 340
from pedunculated fibroid or polyp lying within the vagina, 339
from prolapsus uteri, 340
from submucous fibroid lying within the cavity of the uterus, 339
from submucous fibroid with partial inversion, 339
operations for, 342
prophylaxis of, 340
reduction by taxis, 340
treatment of, 340

K

Kelly-Pawlik method of cystoscopy, 839
Knee-chest position, 105, 106
in cystoscopy, 842
in reposition of retroverted uterus, 363
Kraurosis vulvæ, 546

L

Labia, absence of, 263
actinomycosis of, 400
anatomy of, 264
angioma of, 393
anomalous developments of, 263
atresia of, 263
atrophy of, 546
cancer of, 562
cysts of, 560
dermoid, 560
sebaceous, 559
double, 263
edema of, 396
enchondroma of, 559
erysipelas of, 398
fibroma of, 559
Labia, gangrene of, 396
gonorrhea of, 398
hematoma of, 395
hemorrhage from, 22
hypertrophy of, 264, 553
infantile, 263
inflammation of, 397
injuries of, 762–764
itching of (pruritis), 403
kraurosis vulvæ, 546
lipoma of, 559
neuroma of, 559
noma pudendi, 397
sarcoma of, 567
syphilis of, 399
tuberculosis of, 399
tumors of, 559
varicose veins of, 393
wounds of, 762
Labor complicated by ovarian tumors, 731, 747
prolapsus uteri, 333
uterine fibroids, 630
false, 157
spurious, 157
Laceration of cervix, 791
immediate repair of, 793
late repair of, 794
of perineum, 762
immediate repair of, 765
late repair of, 782
of uterus, 797
of vagina, 763
of vulva, 762
Lactation atrophy of uterus, 549
Latent fibroids of uterus, 584
Lateroposition of uterus, 312
Leakage of ovarian cyst, 733
Leucocytosis, 80
inflammatory, 81
in malignancy, 82
in ovarian tumors, 82
posthemorrhagic, 80
of pregnancy, 80
postpartum, 80
Leucorrhea, 63
in cancer of uterus, 641
diagnosis of, 65
douches for, 199
in endometritis, 422
in infancy, 63
normal secretions, 63
in old women, 54
in period of sexual maturity, 64
in prolapsus uteri, 325
tampons for, 213
treatment of, 65
in virgins, 64
Ligation of veins in puerperal sepsis, 436
in varicose veins of pelvis, 518
of vulva, 394
Lipoma of Fallopian tubes, 701
of vulva, 559
Lithopedion in ectopic pregnancy, 154
Lithotomy position, 101, 105

Liver, tumors of, differentiated from ovarian tumors, 729
Local treatment, 187. *See* Non-operative treatments.
preparatory to operation, 243
Lymphangioma of ovary, 716

M

Mackenrodt's operation for vesico-vaginal fistula, 817
Maldevelopments of genital organs, 262
Malformations causing sterility, 70
of Fallopian tubes, 286
of genital organs, 262
of ovaries, 286
absence of one or both, 286
congenital largeness, 286
smallness, 287
supernumerary, 287
of uterus, 276
uterus accessorius, 286
bicornis, 282
deficiens, 276
didelphys, 286
fetalis, 279
rudimentarius, 279
septus, 282
unicornis, 280
of vagina, 270
absence of, 270
atresia of, 272
blind pouches, 276
double vagina, 275
stenosis, 272
of vulva, 262
absence of, 262
adhesions of prepuce, 265
atresia of, 262
congenital anomalies of, clitoris, 264
fissures, 265
double vulva, 263
hypertrophy of, 264
infantile, 263
Malignancy, contra-indicating massage, 217
in ovarian tumors, 742
Malignant degeneration of chorionic villi, 177
of fibroids of uterus, 604
of ovarian cysts, 734
Malposition, causing sterility, 70
of Fallopian tubes, 382
changes in position, 384
hernia, 388
normal position, 384
of ovaries, 384
changes in position, 356
descensus ovarii, 386
hernia of ovary, 388
normal position, 384
prolapse, 386
of uterus, 305
anteflexion of, 347
Malposition of uterus, anteposition of, 309
anteversion of, 345
hernia of, 381
inversion of, 334
lateroposition of, 312
pathological fixation of, 308
mobility of, 308
prolapse of pregnant uterus, 333
prolapsus uteri, 315
retroposition, 312
retroversioflexion, 352
of the vaginal walls, 288
cystocele, 288
rectocele, 299
vaginal hernia, 302
Mammary glands in ectopic pregnancy, 156
Marriage of near relative, cause of sterility, 69
Martin's amputation of cervix (circular amputation), 796
Massage, abdominal, 220
pelvic, 216
Mechanical disturbances, causes of pelvic inflammation, 393
Membranous dysmenorrhea, 45
Menorrhagia. *See* Uterine hemorrhage.
x-rays in treatment of, 225
Menopause, 33, 73
clinical manifestations of, 75
corpus luteum in, 77
delayed, 74
influence of morbid conditions on, 76
management of, 76
premature, 73
time of appearance of, 74
Menstrual molimina, 40
Menstruation, 23
anatomy of, 24
bathing during, 195
fibroids of uterus, influence on, 576
frequency of, 23
pain during, 44
physiological absence of, 37
precocious, 23
quantity of, 24
time of onset, 23
tubal, 26
pregnancy, 156
without ovaries, 26
Mensuration of abdomen, 99
of pelvis, 99
Mental shock causing amenorrhea, 38
Mesentery, chylous cysts of, 729
Metastatic foci of cancer of uterus, 657
of chorioepithelioma malignum, 184
Metritis, 434
acute, 434
chronic, 438
treatment of, 434
coli, differentiated from cancer of cervix, 652
gonorrheal, 525
Microcystic degeneration of ovaries, 484

Microscopic examinations of scrapings and excised parts, 133
fixing specimens, 136
frozen specimens, 134
hardening and embedding, 136
inspection of uterus after removal, 139
removal of uterine tissue, 133
staining and mounting, 138
test curettage, 134
excision of cervix, 134
Miscarriages, in case taking, 21
Mittelschmertz, 46
treatment of, 48
Mole formations, 154
Morning sickness in tubal pregnancy, 156
Mortality of cancer of cervix, 660
of fibroids of uterus, 605
of ovariotomy, 752
Movable kidney, differentiated from extra-uterine pregnancy, 164
Mucous patch on cervix (erosions), 416
polyps, 416
causing uterine hemorrhage, 28
differentiated from cancer, 655
Multiple ectopic pregnancy, 154
Muscular insufficiency of uterus, 30
Mustard plaster, 211
Myoma of Fallopian tubes, 701
of ovary, 716
Myxoma of ovary, 716
Myxomatous degeneration of fibroids, 589

N

Narcosis, examination under chloroform, ether, 112
Nasal dysmenorrhea, 46
Nationality in case taking, 21
Nauheim bath, 195
Nervous diseases causing amenorrhea, 38
Neuroma of vulva, 559
New formations causing sterility, 71
of Fallopian tubes, 700
carcinoma, 701
cystic, 703
dermoid cysts, 701
fibroid, 701
fibromyxoma cystoma, 701
lipoma, 701
papilloma, 700
polyps, 701
sarcoma, 701
of ovary, 703
carcinoma, 712
New formations of ovary, connective-tissue tumors, 715
angioma, 715
enchondroma, 715
fibroma, 715
lymphangioma, 715
myoma, 715
myxoma, 715
osteoma, 715
cysts, 703
dermoid, 714
endothelioma, 717
malignancy of, 742
simple, 703
mortality of, 752
ovariotomy, abdominal, 739
vaginal, 737
postoperative complications of, 744
of pelvic ligaments, 699
broad ligaments, 699
ovarian ligaments, 699
round ligaments, 700
of uterus, carcinoma, 623
chorioepithelioma malignum, 174
endothelioma, 692
fibromyoma, 575
of vagina, 567
carcinoma, 570
cysts, 567
endothelioma, 574
fibromyoma, 569
sarcoma, 574
syncytioma, 574
of vulva, 559
cancer, 562
cysts, dermoid, 560
of hymen, 560
vulvar, 560
enchondroma, 559
fibroma, 559
lipoma, 559
neuroma, 559
sarcoma, 567
Nitze cystoscope, 830
Noble operation for cystocele, 297
on uterosacral ligaments, 377
Noma pudendi, 397
Normal genital tract, bacteriology of, 84
position of Fallopian tubes, 382
of ovaries, 384
of uterus, 305
secretions of genital organs, 63
of body of uterus, 63
of cervix, 63
of Fallopian tubes, 63
of vulva, 63
Nourishment after operation, 891
Nutritive changes in fibroids of uterus 601

O

Obesity, causing sterility, 69
Occupation in case taking, 20
Omental tumors, differentiated from ovarian tumors, 724
One-child sterility, 68
Oöphoritis, 483. *See* Ovaritis.
Operating room, contents of, 260
room in hospital, 257
in private home, 259
table, warming the, 257
Organ of Rosenmüller, 385
Organotherapy, 227
Osteoma of ovary, 716
Osteomalacia, *x*-rays in, 225
Ovarian abscess, 761
cysts, complicating pregnancy, 735
exploratory puncture of, 735
fate of, 736
malignant degeneration of, 735
differentiated from ascites, 725
from bladder, distended, 723
from echinococcus cysts, 724
from ectopic pregnancy, 160, 723
from fatty tumors, 729
from fibroids, 721
from hematocele, 722
from hematoma, 722
from hydronephrosis, 729
from hydrosalpinx, 461
from obesity, 729
from pancreatic cyst, 728
from parametritic abscess, 721
from parovarian cyst, 724
from pericecal abscess, 722
from perimetritic exudate, 721
from retroflexed pregnancy of uterus, 722
from splenic tumor, 728
from tumor of liver, 729
tumors of omentum, 724
from uterine pregnancy, 723
extract, 227
ligament, cancer of, 699
fibroma of, 699
sarcoma of, 699
pregnancy, 151
tumors, 703
adherent, 730
bilateral, 729
complicating pregnancy, 744
hemorrhage into, 733
leakage of, 733
malignancy of, 742
rupture of, 732
suppuration of, 734
torsion of pedicle of, 731
Ovaritis, 483
acute gonorrheal, 483
septic, 483
chronic, 483
diagnosis of, clinical, 490
acute stage, 490
chronic stage, 490
differential, 491
treatment of, 492
Ovariotomy, abdominal, 739
complications of, 750
contra-indications of, 737
for dysmenorrhea, 750
effect of, on menstruation, 39
indications for, 736
in intraligamentary cysts, 741
mortality of, 752
vaginal, 736
Ovary, abscess of, 489
absence of, 286
accessory, 287
anatomy of, 384
anomalies of, 286
atrophy of, 550
bacteriology of, 88
cancer of, 712
changes in position of, 386
circulatory disturbances in, 480
congestion of, 491
conservative operations on, 753
cystic degeneration of, 30
cysts of, 703
corpus luteum, 703
displacements of, 384, 386
endothelioma of, 717
fibroma of, 715
follicular hemorrhages in, 487
hematoma of, 480
hemorrhages into, 482
hernia of, 388
histology of, 385
hypertrophy of, 558
inflammations of, 483
treatment of, 492
malformations of, 286
menstruation without ovaries, 26
myoma of, 715
new formations of, 703
sarcoma of, 715
supernumerary, 287
torsion of pedicle of, 531
tuberculosis of, 541
tumors of, 703

P

Pain in cancer of uterus, 641
during menstruation, 41
relief from, after operation, 890
in retroversioflexion, 358
Palpation of abdomen, 93
Pancreatic cysts, differentiated from ovarian cysts, 728
Papillary erosions of cervix, 417
Papilloma of Fallopian tubes, 700

Papilloma of ovary, 709, 741
Paraffin sections, 137
Parametric exudations, differentiated from ovaritis, 492, 461
from pyosalpinx, 461
Parametritis, 510
acute, 510
atrophicans, 309
chronic, 512
posterior, 309
Parametrium, cancerous invasion of, 655
Parasites of Fallopian tubes, 466
Paratyphlitic exudates, differentiated from pelvic cellulitis, 515
Para-uterine inflammations, 510
causing uterine hemorrhage, 28
Paravaginitis, 411
Parovarian cysts, 718
differentiated from hydrosalpinx, 461
from ovarian cyst, 724, 730
Parovarium, 385
Passive congestion causing uterine hemorrhage, 27
Pathological, fixation of uterus, 308
mobility of uterus, 308
Pedunculated fibroid of uterus, 581
Pelvic abscess, 516
cellular tissue, bacteriology of, 89
cellulitis, 510
acute, 510
chronic, 512
classification of, 510
definition of, 510
diagnosis of, 512
differentiated from hematoma, 515
from malignancy, 516
from paratyphlitis, 515
from psoas abscess, 516
from subserous fibroids, 515
exudate, differentiated from extra-uterine pregnancy, 159
floor, wounds of, 762
hematocele, 161
hematoma, differentiated from ectopic pregnancy, 161
from pelvic cellulitis, 510
infections, 389
barriers to, 390
causes of, 390
local causes of, 392
inflammation, 389
causing sterility, 71
massage in, 216
treated by douches, 200
by tampons, 212
massage, 215
contra-indications, 216
indications for, 216
physiological action of, 216
technic of, 217
Pelvimeter, 117
Percussion of abdomen, 97
Pericecal abscess, differentiated from ovarian cyst, 722
Perimetric exudate, differentiated from ovarian cyst, 721
Perimetritis, pressure therapy in, 221
Perineorrhaphy, 763
after-treatment of, 780
Emmet's, for complete laceration, 782
for incomplete laceration, 774
Holden's, 769
Tait's, for complete laceration, 783
for incomplete laceration, 776
Perineum, immediate repair of, 763, 766
late repair of, 764, 768
Periovaritis, 756
Peritoneal adhesions, 506
exudates, 506
Peritoneum, bacteriology of, 89
Peritonitis, 493
adhesions in, 506
definition of, 503
diagnosis of, clinical, 507
differential, 507
from pelvic cellulitis, 515
etiology of, 505
exudates in, 506
following operations, 909
general, 493
gonorrheal, 501
non-septic, 493
pathology of, 505
pelvic, 503
postoperative, 495
puerperal, 500
traumatic, 493
treatment of, 508
tuberculous, 502, 544
Perityphlitis, differentiated from ovaritis, 492
Pessaries in anteflexion, 348
in cystocele, 293
in prolapsus uteri, 330
in retroversioflexion, 364
stem, in dysmenorrhea, 54
Phantom tumor, 724
Phlebitis, contra-indicating massage, 217
in fibroids of uterus, 604
Physical training in schools, 230
Pituitrin, 228
Plethora, causing uterine hemorrhage, 27
Pneumonia, postoperative, 906
Polypoid endometritis, 426
Polyps, causing uterine hemorrhage, 28, 129
of cervix, 415
mucous, 426
Position of patient, after operation, 889
Postabortive endometritis, 424
Postoperative complications, 886
Precocious menstruation, 23
Pregnancy in bicornate uterus, 160
complicating cancer of cervix, 676
fibroids, 600
ovarian cysts, 735
contra-indicating massage, 217
passage of sound, 127

Pregnancy differentiated from ovarian cyst, 723
influence of gonorrhea on, 528
of uterine fibroids on, 576
labor, and puerperium complicated by ovarian cysts, 744
prolapsus uteri, 339
uterine fibroids, 630
in a retroverted uterus differentiated from ectopic pregnancy, 158
in a rudimentary horn, 160
Pregnant uterus, prolapse of, 333–339
Premature menopause, 73
Preparation of field of operation, 244
for operation in the home, 258
of patient for operation, 242
choice of local or general anesthesia, 246
combined gynecological operations, 250
diet, 251
examinations for contra-indications, 242
local treatment, 243
of surgical utensils, 254
bandages, 255
basins, 255
brushes, 254
catgut, 255
cotton, 255
gauze, 255
linen, 255
rubber drainage pads, 255
silk, 255
sponges, 255
towels, 255
Prepuce, adhesions of, 265
Present complaints in case taking, 22
Pressure therapy, 220
indications for, 221
technic of, 222
Progressive tissue changes, 551
Prolapse of anterior vaginal wall, 288
of posterior vaginal wall, 288
of pregnant uterus, 333
of urethra, 848
Prolapsus uteri, differentiated from inversion, 34
prophylaxis of, 327
vaginæ, 318
Pruritus vulvæ, 403
x-rays in, 224
Pseudodiphtheritic endometritis, 426
Psoas abscess, differentiated from pelvic exudate, 516
Public play grounds and baths, 230
Puerperal endometritis, 424
infection, cause of pelvic inflammation, 392
curettage for, 436
hysterectomy for, 436
ligation of veins in, 436
peritonitis due to, 500
removal of placental tissue in, 436
of vulva, 399
Puerperal peritonitis, 500
vaginitis, 406
vulvitis, 399
Pulmonary embolism, 902
Puncture of uterus, 799
Purpuric conditions, causing uterine hemorrhage, 27
Pus tubes, 455
Pyemia following operation, 911
Pyosalpinx, 455
acute, 456
chronic, 457
treatment of, 470
vaginal drainage in, 476

R

Radical abdominal operation for cancer of cervix, 655
Rectocele, 299
anatomy of, 299
diagnosis of, 301
etiology of, 299
symptoms of, 300
treatment of, 302
Rectolabial fistula, 804
Rectoperineal fistula, 804
Rectovaginal fistula, 804
hernia, 299
examination of, 112
gonorrhea of, 527
Recurrence of uterine cancer, 678
fibroids, 584
Recurrent ectopic pregnancy, 144
Reflex symptoms in retroversioflexion, 358
Renal colic, differentiated from ectopic pregnancy, 163
Replacement of uterus in inversion, 340
in prolapsus, 329
Retained placental tissue differentiated from cancer, 654
use of curet in, 126
Retrogressive changes in fetus of ectopic pregnancy, 154
tissue changes, 546
Retroposition of uterus, 310
Retroversioflexion of uterus, 352
differentiated from anteflexion, 362
from fibroids, 362
from retroposition, 361
treatment of acute stage, 362
of chronic stage, 362
Rodent ulcer of vulva, 395, 396
Röntgen rays, 223
Round ligaments, cancer of, 700
fibroma of, 700
sarcoma of, 700
Rudimentary Fallopian tubes, 286
ovaries, 287
uterus, 279

S

Social state, in case taking, 21
Sacro-iliac joint, mobility of, 57
Sactosalpinx, contents of, 459
diagnosis of, 458
differential, 459
hemorrhagica, 458
purulenta, 455–458
serosa, 458
treatment of, 476
twisted pedicle of, 462
Saline injections, 202
general indications for, 203
enteroclysis, 203
hypodermoclysis, 204
intravenous injections, 205
Salpingectomy, 478
Salpingitis, catarrhal, 447
classification of, 447
differentiated from appendicitis, 459
from new formations of tubes, 461
from ovarian cysts, 461
tumors, 461
from parametric exudates, 461
from parovarian cysts, 461
from subserous fibroids, 460
gonorrheal, 526
isthmica nodosa, 449
purulent, 453
acute, 454
chronic, 455
clinical diagnosis of, 456
etiology of, 453
tuberculous, 462
Salpingostomy, 478
Sarcoma of broad ligaments, 699
of cervix, 653
choriocellulare, 174
of Fallopian tubes, 701
of ovary, 716
of urethra, 851
uterine hemorrhage in, 29
of uterus, 693
anatomy of, 694
diagnosis of, clinical, 697
microscopic, 696
etiology of, 693
prognosis of, 697
treatment of, 698
of vagina, 574
of vulva, 567
x-rays in treatment of, 224
Sarcomatous degeneration of uterine fibroids, 591, 697
School girl, hygiene of, 229
Schools, physical training in, 230
Schroeder's amputation of cervix, 795
Schuchardt operation for cancer of cervix, 662
Sea bath, 194
Sebaceous cysts of vulva, 559
Senile endometritis, 425
Senile vaginitis, 409
Septic intoxication following operation 910
peritonitis, 494
anatomy of, 495
causes of, essential, 494
predisposing, 494
clinical manifestations of, 495
prognosis of, 496
treatment of, 496
Septicemia following operation, 910
Serum and organotherapy, 227
antitoxin of diphtheria, 227
corpus luteum, 228
ovarian extract, 227
pituitrin, 228
thyroid extract, 228
tuberculin, 545
Sexual excess, causing sterility, 69
incompatibility, causing sterility, 69
Shock, surgical, 897
Shower bath, 191
Simon's speculum, 118
Simple cysts of ovary, 703
erosion of cervix, 417
vaginal hysterectomy for cancer of cervix, 660
Simpson's operation on round ligaments, 376
Sims' glass vaginal plug, 272
operation for vesicovaginal fistula, 815
retractor, 118
Sitz bath, 194
Sound, uterine, 122
Speculum, vaginal, 118
Sphincter ani muscle, repair of, 786
Spiegelberg's sign of cancer, 656
Spinal anesthesia, 250
Splenic tumors, differentiated from ovarian tumors, 728
Spurious labor, 157
Squamous-cell cancer, 634
of body of uterus, 649
of cervix, 634
Static backache, 57
Stenosis of vagina, 272, 790
Sterility, 67
alcoholism in, 69
anemia in, 69
conditions essential to conception, 67
definitions of, 67
etiology of, 68
gonorrhea, in relation to, 527
one-child, 67
in retroversioflexion, 357
treatment of, 72
Stimulation after operation, 888
Stricture of ureter, 883
of urethra, 847
Subinvolution of uterus, 555
causing pelvic inflammation, 395
uterine hemorrhage, 28
Submucous fibroids, 582
Subserous fibroids, 583

Supernumerary ovaries, 287
causing menstruation, 26
Supporter, abdominal, 896
Suppuration of fibroids of uterus, 589
of hematoma, 152
of ovarian cyst, 734
Suppurative salpingitis, 453
Surgical instruments, sterilization of, 356
shock, 897
Swabs, 225
in chronic metritis, 439
Syncytioma malignum, 174
causing uterine hemorrhage, 29
of uterus, 74
of vagina, 574
Syphilis of Fallopian tubes, 466
of uterus, 32
of vagina, 573
of vulva, 399
Syphilitic uterine hemorrhage, 32

T

Tampons, 211
drainage, 214
hemorrhage, 211
indications for, 211
pelvic inflammation, 212
protection against infection, 215
uterine support, 215
Taxis in inversion of uterus, 340
Telangiectatic fibroids of uterus, 589
Therapeutic application of baths, 96
Thrombosis, contra-indicating massage, 217
in fibroids of uterus, 604
Thyroid extract, 228
Todd-Gilliam operation, 368
Torsion of fibroid of uterus, 593, 601
of pedicle of ovarian cyst, 731
of uterus, 315
Trachelorrhaphy, 794
Traumatic peritonitis, 493
Traumatisms causing sterility, 71
Treatment, non-operative, 187
counterirritation, 211
electricity, 228
hot air, 209
pack, 215
hydrotherapy, 188
pelvic massage, 215
pressure therapy, 220
serum and organotherapy, 227
swabs, 225
tampons, 211
vaginal douche, 196
x-ray therapy, 223
Trigone, 827
Tubal abortion, 152
menstruation, 26
pregnancy, 143. *See* Extra-uterine pregnancy.
Tuberculin, 545
Tuberculosis of Fallopian tubes, 541
of ovaries, 541
Tuberculosis of pelvic organs, 539
contra-indicating massage, 217
etiology of, 539
Tuberculous cystitis, 860, 863
endometritis, differentiated from cancer, 655
peritonitis, 502, 544
treatment of medical, 502
surgical, 503
salpingitis, 462, 541
avenues of extension, 463
diagnosis of, anatomical, 464
clinical, 465
etiology of, 462
treatment of, 478
ulcer of cervix, differentiated from cancer, 651
of uterus, 541
of vagina, 540, 573
vaginitis, 408, 540
vulvitis, 399, 540
Tuboövarian abscess, 489
cyst, 450, 703
Tuboperitoneal gestation, 148
Tumors of bladder, 865
of Fallopian tubes, carcinoma, 701
cystic, 701
dermoid cysts, 701
differentiated from salpingitis, 461
fibroma, 701
fibromyxoma cystoma, 701
lipoma, 701
myoma, 701
papilloma, 700
polyps, 701
sarcoma, 701
of ovary, 703
carcinoma, 714
connective tissue tumors, 715
angioma, 715
enchondroma, 715
endothelioma, 717
fibroma, 715
lymphangioma, 715
malignancy in, 742
mortality of, 752
myoma, 715
myxoma, 715
osteoma, 715
ovariotomy, 736
abdominal, 739
complicating pregnancy, 744
conservative operations, 753
postoperative complications of, 744
vaginal, 737
sarcoma, 715
cysts, simple, 703
corpus luteum, 703

Tumors of ovary, cysts, simple, follicular, 703
tuboövarian, 703
of pelvic ligaments, 699
of broad ligaments, 699
of ovarian ligaments, 699
of round ligaments, 700
treatment of, 700
of uterus, carcinoma, 632
endothelioma, 692
fibromyoma, 575
sarcoma, 693
syncytioma malignum, 174
of vagina, cancer, 570
cysts, 567
endothelioma, 574
fibromyoma, 569
sarcoma, 574
syncytioma, 574
of vulva, cancer, 562
cysts, 560
dermoid, 560
sebaceous, 559
fibroma, 559
lipoma, 559
neuroma, 559
sarcoma, 567
Turkish bath, 195
Twisted pedicle of fibroids of uterus, 593
of ovarian cyst, 731

U

Ulcerative vaginitis, 407
Ulcers of cervix, 420
cancerous, 634
decubitus, 420
tuberculous, 420
in prolapsus uteri, treatment of, 329
of vagina, decubitus, 408, 410, 573
differentiated from cancer, 573
diphtheritic, 408, 410
puerperal, 408, 410
syphilitic, 408, 410, 573
tuberculous, 408, 410, 573
of vulva, 399
rodent, 395, 396
syphilitic, 399
tuberculous, 399
Ureter, 869
anatomy of, 869
calculus of, 881
congenital anomalies, 874
catheterization of, 870
examination of, 870
fistula of, 806, 821
hydroureter and hydronephrosis, 884
inflammation of, 876
obstruction of, calculus, stricture, 878
palpation through vagina, 112
physiology of, 869
stricture of, 883, 884
Ureteral orifices, 827
Ureteritis, 876
Urethra, 824
absence of, 845
anatomy of, 825
atresia of, 845
carcinoma of, 851
calculus of, 881
dilatation of, 846
dislocation of, 848
displacement of, 846
epispadias, 846
examination of, methods of, 829
catheter and sound, 830
cystoscopy, 830
inspection, 830
Kelly-Pawlik, 830
Nitze, 830
palpation, 829
percussion, 829
urethroscopy, 830
fibroma of, 851
fistula of, 804
foreign bodies in, 851
hypospadias, 846
inflammation of, 521, 523, 530, 848
inspection of, 83
malformations of, 845, 846
acquired, 846
congenital, 845
newgrowths of, 850
obstruction of, 878
palpation of, 829
physiology of, 825
prolapse of, 848
sarcoma of, 851
stricture of, 847, 883
tumors of, 850
Urethral caruncle, 851
fistulæ, 806
speculum, introduction of, 830
Urethritis, 848, 871
acute, 848
chronic, 849
Urethroscopy, 830
Uterine curet, 126
contra-indications for, 127
dangers of, 128
indications for, 126
technic of, 129
in treatment, 130
decidua in ectopic pregnancy, 157
dilators, 121
fibroids, 575. *See* Fibromyoma uteri.
hemorrhage, 27
causes of local, 28
systemic, 27
character of blood, 33
treatment of, 33
x-rays in, 225
pregnancy, complicated by a tubal or ovarian swelling, 159
differentiated from uterine fibroids, 577
sound, 122

Uterine sound, contra-indications to use of, 125
dangers in use of, 125
indications for, 123
preliminary procedures, 123
support by pessaries. *See* Pessaries.
by tampons, 215
Uterus, abscess of, 345
absence of, 276
accessory, 286
anatomy of, 307, 384
anteflexion of, 347
anteposition of, 309
anteversion of, 345
arteriosclerosis of, 30
atrophy of, 547
bacteriology of, 86
bicornis, 282
bilocularis, 282
cancer of, 632
circulatory disturbances in, 615
deficiens, 276
descent of, 315
development of, 306
didelphys, 286
displacements of, 288
double, 286
duplex, 286
elevation of, 313
endothelioma of, 692
fibroid tumors of, 575
fixation of, 308
fœtalis, 279
gonorrhea of, 520
hemorrhage from, 27
hernia of, 381
inflammation of, 415
injuries of, 797
inspection of, after removal, 139
inversion of, 334
lactation atrophy of, 549
lateral position of, 312
malpositions of, 305
membranes expelled from, 142
membranous, 279
normal position of, 305
perforation of, 797
prolapse of, 315
removal of, 30, 266, 331, 344, 381, 436, 442, 471, 609, 620, 621, 626, 660
retroposition of, 310
retroversioflexion of, 352
rudimentarius, 279
sarcoma of, 693
separatus, 286
septus, 282
subinvolution of, 555
superinvolution of, 549
test curettage of, 126
torsion of, 315
tuberculosis of, 541
tumors of, 575, 632
unicornis, 280

V

Vagina, absence of, 275
atresia of, 272, 790
atrophy of, 549
bacteriology of, 85, 389
blind pouches of, 276
cancer of, 570
chorioepithelioma malignum of, 574
cystocele, 288
cysts of, 567
differentiated from prolapsus uteri, 326
decubitus ulcers of, 573
displacements of, 288
double, 275
endothelioma, 574
examination of, digital, 100
fibromyoma, 569
gonorrhea of, 525, 531
hematocolpos, 272
hemorrhage from, 762
hernia of, 302
inflammations of, 406
injuries of, 763
malformations of, 270
prolapse of, 288, 299
rectocele, 299
sarcoma of, 574
stenosis of, 790
syncytioma malignum of, 574
tuberculosis of, 408, 540
tumors of, 567
ulcers of, 408, 410, 573
Vaginal celiotomy, 614
douche, 196
duration of, 199
medicated, 200
physiological action of, 197
posture in, 197
temperature of, 199
time of application of, 199
hernia, 302
after-treatment of, 305
anatomy of, 302
diagnosis of, 303
etiology of, 302
symptoms of, 302
treatment of, 304
hysterectomy for cancer of body of uterus, 679
of cervix, 660
for inversion of uterus, 344
technic of, 681
for uterine fibroids, 609
myomectomy, 609
portion of cervix, cancer of, 570
sarcoma of, 694
shortening of uterosacral ligaments, 377
speculum, 118
tampons in cystocele, 293
walls, malpositions of, 288
Vaginismus, 412
Vaginitis, 406
catarrhal, 407

Vaginitis, condylomatous, 409
emphysematous, 408
gonorrheal, 525
senile, 409
tuberculous, 408
ulcerative, 408
Varicocele of broad ligaments, 517
Varicose veins of vulva, 393
Venereal diseases causing sterility, 72
Ventrofixation of uterus, 368
Ventrosuspension, 365
Vesical fistula, 807
Vesicocervical fistula, 810
Vicarious menstruation, 40
Vulva, absence of, 263
anatomy of, 290, 291
anomalies of, 262
atresia of, 263
atrophy of, 546
bacteriology of, 85
cancer of, 562
circulatory disturbances in, 393
condylomata acuminati of, 552
cysts of, 560
dermoid, 560
sebaceous, 559
double, 263
edema of, 396
elephantiasis of, 550
enchondroma of, 559
erysipelas of, 398
furunculosis of, 401
gangrene of, 396
gonorrhea of, 398
hematoma of, 395
hemorrhage from, 22
hypertrophy of, 553
infantile, 263
inflammations of, 397
lipoma of, 559
malformations of, 262
neuroma of, 559
new formations of, 559
operation on, preparation for, 246
sarcoma of, 567
syphilis of, 399
tuberculosis of, 399, 540
tumors of, 559
ulcers of, 399
rodent, 395, 396
Vulsellum forceps, 120
Vulvitis, 397
actinomycosis, 400
bartholinitis, 401
catarrhal, simple, 397
erysipelatous, 398
furunculous, 401
gonorrheal, 398, 531
pruritus vulvar, 403
puerperal, 399
syphilitic, 399
treatment of, 404
tuberculous, 399
Vulvovaginitis, gonorrheal, 531

W

Waist constriction causing circulatory disturbances in pelvis, 393
Water drinking, 208
sterilized, 257
Webster-Baldy operation, 371
Wertheim operation for cancer of cervix, 565
Willis operation on round ligaments, 373
Women, gonorrhea in, 520
Wounds of cervix, 791
of pelvic floor, 762
of uterus, 797
of vagina, 788
of vulva, 762

X

X-ray therapy, 223
in cancer of cervix, 223
in eczema, 224
in lichen planus, 225
in menorrhagia, 225
in osteomalacia, 225
in pruritus vulvæ, 224
in sarcoma of cervix, 224
in tuberculosis, 224
in uterine fibroids, 225

Z

Zenker's fluid, 136
Zinc chloride in chronic metritis, 441

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